Beyond the PhD:

The significance of boundaries in the early careers of highly qualified Greek scientists and engineers

by

Charikleia Tzanakou

A thesis submitted in partial fulfilment of the requirements for the degree of Doctor of Philosophy in Employment Research

University of Warwick, Institute for Employment Research

October 2012

Table of contents

Acknowledgements

This dissertation would not have been possible without the study participants who made the fieldwork one of the most fascinating parts of this research and offered generously their time and their personal views. In addition, I would like to thank the National Documentation Centre (especially Mr Panagiotis Schizas), DOATAP, EL.STAT, HESA and alumni centres of UK universities for providing statistical information and access to their data for my sample.

I would like to thank the Institute for Employment Research for funding my doctoral studies and providing the opportunity to work as a research assistant during my PhD, contributing to a range of interesting projects. I am truly indebted and thankful to my supervisors: Kate Purcell for her continuous enthusiasm, encouragement, stimulating questions and understanding; and Robert Lindley for his technical expertise, structural and practical interventions to this thesis. I will be eternally grateful to Sally-Anne Barnes for being there in the past few months, providing invaluable help, and immense support practically, intellectually and psychologically. I found a great friend in you.

I would like to extend my warm thanks to my ‘online’ friends and family in Greece (Rannia, Vasiliki, Eleni and many more) but also my good friends here at Warwick (‘my UK family’: Ioanna, Jane, Paulo, Pamela, Ruth, Claudia) who have supported me continuously during this long and challenging journey.

I would also like to thank Grier Palmer for providing the opportunity to develop my teaching experience and be involved in exciting intellectual activities of WBS. I am obliged to many of my colleagues who supported me in IER and WBS and helped me either practically or with their positive attitudes and smiles during my studies here.

Last but not least, I wish to thank my family (Mum, Dad, Giota and my grandparents) and my partner, Theo. There are no words to express my gratitude for your support in every possible way during this period of my life. The least I could do is devoting this thesis to you.

Abstract

Higher education and research have come to the forefront of international debate about economic growth highlighting the significance of doctoral education for fostering innovation and international competitiveness. Currently, there is limited information about doctoral graduates in Greece from both a demand and supply side. This study seeks to address this gap by examining the early career paths of Greek doctoral graduates in natural sciences and engineering educated in Greece and the UK, and how they are deployed in the labour market. This study is informed by the debate on human capital and its links to productivity and growth, social capital influences, career theories and the existing evidence on highly skilled migration.

A mixed methods approach was adopted to deliver new quantitative and qualitative data and enable the understanding of complex phenomena, such as careers. An online survey of Greek PhD graduates was complemented by follow-up interviews with a sub-sample, to explore their perceptions of doctoral education and its outcomes. The career trajectories of Greek doctorate holders, together with individual and contextual determinants that shape career choices are presented. Within this investigation, the effect of country of doctoral study, and doctoral education experience are also explored. Emphasis is given to disciplinary labour markets in relation to engineering and biological sciences and the academic system in Greece as contextual considerations that influence career choices. This information is extended by a small number of interviews with Greek-based non-academic employers, contributing to a better understanding of their views, informing both the PhD graduates and employers' (mis)perceptions regarding doctoral education and its value beyond academia.

Overall, it will be concluded that Greek PhD graduates are under-utilised in the Greek labour market raising concerns about educational investment and potential brain drain under the current economic crisis in Greece.

Abbreviations

ADIP: Hellenic Quality Assurance and Accreditation Agency

ASEP: Supreme Council for Civil Personnel Selection

BERD: Business Enterprise Research and Development Expenditure

CDH: Careers of Doctorate Holders

EACEA: Education, Audiovisual and Culture Executive Agency

EC: European Commission

EHEA: European Higher Education Area

EL.STAT: Hellenic Statistical Authority

ELEPETYD: Hellenic Association of Doctoral Candidates

ELIAMEP: Hellenic Foundation for European and Foreign Policy

ERA: European Research Area

ESET: National Research and Technology Council

EUA: European University Association

EURODOC: European Council of Doctoral Candidates and Junior Researchers

FP: Framework Programme

GBAORD: Government Budget Appropriations or Outlays on R&D

GDP: Gross Domestic Product

GERD: Gross Domestic Expenditure on R&D

GR: Greece

GSRT: General Secretariat for Research and Technology

HEI: Higher Education Institution

HEIs: Higher Education Institutions

HESA: Higher Education Statistics Agency

IKY: National Scholarship Foundation

KBE: Knowledge-Based Economy

LFS: Labour Force Survey

MNC: Multinational Company

NARIC: National Academic Recognition Information Centre

NDC: National Documentation Centre

NSRF: National Strategic Reference Programme

OECD: Organisation for Economic Cooperation and Development

P.D: Presidential Decree

PPS: Purchasing Power Standards

R&D: Research & Development

RCUK: Research Councils UK

S&E: Science and Engineering

SME: Small and Medium Enterprise

TEE: Technical Chamber of Greece

TEIs: Technological Education Institutions

UK: United Kingdom

List of tables

List of figures

Chapter 1 INTRODUCTION

Various boundaries are crossed and shaped by PhD graduates during and beyond their doctoral education, such as spatial, disciplinary, occupational and cultural. In this study, these boundaries are examined in the context of the early careers of highly qualified Greek scientists and engineers after obtaining their doctorate in a Greek or UK university.

Higher education and research have come to the forefront of international debates about economic growth. Research degree education, assumed to be the pinnacle of scholarship for those equipped by intellect and motivation to benefit from it, has been seen as central to the development of innovation and international competitiveness in a world where knowledge is more important than material and human resources *per se*. It is increasingly considered to be central to advanced economic development and measures of national effort and is included among the economic indicators intended to inform policy reform and facilitate monitoring. While human capital and its relationship to productivity, growth and competitiveness is debated, the importance of human capital (and particularly that of doctoral graduates who have accumulated substantial human capital though education) have been identified as a decisive factor. Economists have highlighted technology (Solow, 1956) and human capital as fundamental to economic growth (Lucas, 1988; Glaeser; 2000). There has been a growing consensus among policy-makers that post-industrial society requires more highly-educated people

with technical and professional skills in a knowledge-based economy. Here, knowledge becomes the new 'fuel', the ultimate economic renewable to economic growth leading to a knowledge-based economy (Brinkley, 2006; Leadbeater, 1999). An OECD working paper about an international study on careers for PhD graduates noted that:

> *"The doctorate holders, as being the highest educated group, are considered most likely to contribute to the advancement and diffusion of knowledge and technologies. As such, they often are seen as one of the key actors behind the creation and knowledge-based economic growth" (Auriol et al., 2010, p.13).*

Data on doctoral education outcomes is increasing at both the national and international level in quantitative terms. For example, the number of doctorate holders by gender, age and disciplinary area and the sectoral distribution of their employment is collected. However, limited information exists about the reasons behind employment and career choices, the value of the PhD beyond pecuniary terms and challenges graduates confront in different contexts.

Taking into account the limited existing evidence for doctoral graduates in Greece, this study employed a mixed methods approach to address this gap. Methods included an online survey and follow-up interviews with Greek doctorate holders awarded a PhD in natural sciences and engineering from a Greek or UK University during 2002-2008. This project initially aimed at collecting substantial quantitative data on the early career paths of this group through the online survey that would be representative of the respective population, comprising the core of this research project. However, as a smaller sample – than planned –could be

achieved, but reasonable, the analyses focused more on the qualitative accounts of a subsample of PhD graduates who responded to the survey. The survey sample was used as an indication of the wider population and to identify different patterns of career trajectory. This enabled an improved understanding and contextualisation of the early career experiences of those interviewed.

This research provides new evidence on the career trajectories of doctoral graduates and allows for a comparison between the Greek and foreign-educated workforce by looking at the overall deployment of these groups in the labour market. As well as contributing to the limited body of knowledge regarding the impact of doctoral education on individual career development and organisational practice, it informs doctoral graduates and the stakeholder communities more widely about the motivations for career decisions and the opportunities that PhD graduates face in the Greek and global labour markets.

The study is focused on the early career steps that Greek PhD graduates follow and potential sectoral transitions (academic to non-academic or vice-versa) and the reasons behind such inter-sectoral mobility. The survey data provide a picture of the employment patterns and career stages of the participants two to eight years after their PhD award. Comparisons between those working in academic and non-academic employment allow for exploration of the differences and similarities between these sectors and how job satisfaction differs by sector or country of employment.

This study also explores how the career paths of the participants developed and what factors played a determinant role in those employment choices. Doctoral education characteristics along with personal and contextual considerations are investigated in relation to their influence on career choices. The different characteristics of doctoral education in Greece and the UK, together with how these can influence subsequent careers, are investigated. Furthermore, in the academic and non-academic disciplinary labour markets in the Greek context – focused on biological sciences and engineering – it is explored in detail how these contextual considerations affected individual careers, drawing upon participant perceptions of their doctoral education experiences and the value of the PhD in relation to their personal development and early career experiences.

The rationale for choosing natural sciences and engineering graduates lies in the assumed importance for Greek research and innovation in Greek socio-economic policy. The early career impact of this targeted group was assumed likely to be easily identifiable by employers relatively early in employees' careers, which might not be the case for those who had studied other disciplines. The terms 'PhD graduates', 'doctorate holders', 'PhD holders' are used interchangeably in this thesis. In addition, any reference to the PhD graduates – and the previous terms – who participated in this study, mainly beyond chapter four, represent Greek PhD graduates from natural sciences and engineering (S&E).

This research considers both the supply and demand side in the Greek context. Thus, the views of Greek employers – with an emphasis on business enterprise

sector – are illustrated regarding the value of this highly skilled workforce in the workplace. Greek employers' perceptions on the role of PhD graduates – compared to a UK sample of employers – are explored on the basis that this would be indicative of the cultural attitudes in Greek firms towards this highly skilled workforce.

The research questions of this study are:

What are the career paths for PhD holders in natural sciences and engineering in the Greek labour market?

What variables determine these career paths?

What are the experiences and perceptions of PhD graduates on the value of the doctorate and their potential 'impact' in their workplace?

What are the experiences, attitudes and perceptions of employers towards recruitment of doctoral graduates in the Greek labour market?

How do the Greek and foreign-educated doctoral workforce compare regarding the Greek labour market? How does country of doctoral study affect career choices and paths?

To what extent are PhD graduates effectively deployed in the Greek labour market?

Conclusions drawn from this study enhance our understanding of the career opportunities and limitations that Greek PhD graduates face, after their graduation, with a focus on the Greek labour market. Looking at the deployment of these Greek doctoral graduates in their home labour market and in combination with empirical evidence and perceptions of PhD graduates and employers, provided some indications on how their skills and knowledge were being used by employers and potentially contributing to the knowledge-base of the economy.

1.1 Structure of the thesis

Chapter **two** reports on different disciplinary approaches mainly human capital theory (Lucas, 1988; Romer, 1986) and social capital theory (Bourdieu, 1986). It also introduces the career systems framework – from career studies – as an appropriate frame to understand careers of PhD graduates. Literature on highly skilled migration is presented since geographical boundaries are crossed by the participants of this research during and after doctoral education. It then turns to the origins and the increasing emphasis of the doctorate for the knowledge based economy illustrated by a literature and policy review. Finally, previous studies on career paths, their determinants, the value of the PhD according to doctorate holders and employers are outlined, discussing findings and methodological approaches and thus identifying gaps that this study addresses.

Chapter **three** introduces the contextual background to the study, including the Greek economic and social context in which participants of this study operated. It refers to general characteristics of the labour market and the economic situation in Greece. It primarily focuses on the Greek national context describing and evaluating – where possible – the research and higher education policies and systems. In the last section, an outline of the Greek and UK doctoral education systems provide an understanding of the population, the trends, and the forms of doctoral education in the two countries. The Greek doctoral labour market is also discussed based on the limited available data and the legislative frameworks that

stipulate the Greek academic system and subsequently the recruitment of academic and research staff in Greece.

Chapter **four** explains the research programme and methodology used in this study. Mixed methods as the analytical framework of this study is introduced and reviewed regarding its advantages and disadvantages and its appropriateness for this study. An online survey and interviews are the main methodological instruments employed to collect primary data for the study population. After defining the populations of interest for this study, the research process followed for the design and implementation of the online survey is outlined. In this chapter, the sample of the online survey is also briefly presented in terms of demographic and doctoral education characteristics to set the scene for the following chapters. It also includes an overview of how the interviews with both PhD graduates and employers were designed, undertaken and analysed, together with details and design of the database of curricula vitae (CV) of PhD graduates. This was built during the data collection phase of this study and forms an additional data collection instrument used in this study.

Chapter **five** refers to the choices of study participants in relation to doctoral education. The effect of motivation, funding, higher education institution and supervisor on early career paths is examined to enhance our understanding of how these factors might affect career choices. Differences between Greek-educated and foreign-educated participants are illustrated with the use of the survey and interview data.

Chapter **six** answers one research question of this study regarding the early career paths of the Greek PhD graduates. Through the combination of different data sources (survey, interviews and CV analysis), trends and patterns are identified in the early career building experience of the participants taking into consideration the country of doctoral education and country of employment. It then focuses on current employment two to eight years after the PhD, examining different aspects of the employment situation of the respondents using the academic/non-academic distinction. The use of factor analysis enriches our understanding of participants' satisfaction regarding different aspects of employment. The comparison of subsamples in terms of the sector of employment and country of current work provides evidence on the differences and similarities in the doctoral labour market, beyond both academia and Greece, and how these are perceived by the participants.

Chapter **seven** introduces the role and value of the doctorate in employment and beyond, according to the survey responses and the reflective accounts of the participants. To start, the importance of the PhD is evaluated in relation to employment terms, such as getting a job, utilising skills and knowledge and contributing to the workplace, plus considering to what extent these issues differ between the academic and non-academic sectors. Then, the analysis of qualitative data highlights the advantages of doctoral education beyond career and employment, including social and personal development benefits. In the final section, the use of the doctorate in career paths of the interviewees is used as the

main criteria for identifying four different career profiles of the study's participants: the global innovator; the Greek academic; the highly-skilled professional; and the under-employed graduate. These are illustrated with interviewee case studies highlighting the differences in terms of personal influences , the doctoral education, plus disciplinary and contextual considerations on career choices.

Given a greater level of specialisation in knowledge and skills, the PhD labour market is likely to be even more segmented than the wider graduate labour market. Thus, chapter **eight** refers to the Greek disciplinary labour markets of PhD graduates from biological sciences and engineering to examine the influence of disciplinary expertise and contextual considerations in providing opportunities, or creating bottlenecks, on the career choices of this highly skilled workforce. The Greek academic sector is also reviewed highlighting the difficulties and challenges that Greek doctorate holders face, including the phenomenon of self-employment in academia, when they embark on an academic career. Gender is also examined to assess to what extent gender inequality exists between the highly skilled.

Chapter **nine** focuses on the demand side of doctoral labour market focusing on non-academic employers in Greece. After setting out briefly the national human relations and management context, the perceptions of Greek employers on the benefits and drawbacks in recruiting PhD graduates are presented. A comparison with UK employers and PhD graduates is adopted where appropriate, to identify common and different perceptions.

Chapter **ten** discusses the main findings of this study taking into consideration the theoretical frameworks and previous studies outlined in chapter two. Perspectives of PhD graduates and employers are reconciled to enhance our understanding about both the demand and supply side of the Greek doctoral labour market. The early career paths of the participants are summarised, highlighting the importance of various determinants shaping their career choices. The comparison of career experiences of foreign-educated and Greek-educated shows that both positive and negative consequences are involved in decisions regarding country of doctoral education. The evidence emerging from this study has policy implications for the Greek state especially under the current economic climate; these are outlined. Limitations of the study and recommendations for future research are presented with a view to contribute further to the investigation of this important policy-relevant topic.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Due to the complexity of doctoral career paths, this study draws upon different disciplines, predominantly sociology and economics, and additional theoretical frameworks (such as the career systems theory) to make sense of these paths and career choices.

In human capital theory, the doctorate is considered as investment in education, which yields not only individual (predominantly financial), but also collective benefits to the workplace, society or economy where PhD graduates reside as claimed by the latest policy discourse presented in this chapter. In sociological terms, the PhD is often more broadly considered as social capital, which may or may not have economic aspects, but is a choice made within different social structures and value systems. While social capital is examined with the help of approaches by Bourdieu (1986), relevant concepts in social capital theory are briefly outlined to present the context within which career choices and paths of PhD graduates are examined. Since this study is focused on the career trajectories of doctorate holders, a social cognitive career theory, such as the systems framework (Patton and McMahon, 1999), is used as appropriate to provide a frame within which to understand the determinants of careers of such a highly skilled workforce. Taking into consideration that some of the PhD graduates in this study are crossing geographical boundaries for doctoral education, or for their career choices beyond the PhD, research on 'brain drain' and studies on highly skilled migration are also relevant.

The origins and criticisms of doctoral education are described to understand the reasons for the changing context of the doctorate, including the policy discourse with a focus at EU level that has elevated the critical role of PhD graduates as part of the highly skilled workforce for the fulfilment of the knowledge-based economy. Finally, previous academic and policy studies on doctoral education and its outcomes addressing perspectives of both PhD graduates and employers are outlined with the view to set out the state of art in this topic and identify the gaps that this study aims to address.

2.2 Human capital theory

One of the most influential frameworks within which the relationship between investment in education and economic growth is explored, is the human capital theory. This is where education is recognised to play a pivotal role in producing human capital with knowledge and skills that, when they are utilised, affect overall productivity leading to economic development. Lucas (1988) argues that there is a positive relationship between the education of the workforce and overall capital productivity and the:

> *"higher the level of education of the workforce the higher the overall productivity of capital because the more educated are more likely to innovate, and thus affect everyone's productivity" (Lucas, 1988 cited by Ranis and Stewart, 2000, p.202).*

Similarly, it has been argued that high educational level of individuals affects also the productivity of the people with whom they work (Perotti, 1993). This leads to both high individual returns and wider social returns. In addition, the emergence of new growth theories (Lucas, 1988; Romer, 1986) with their underlying assumption on the 'endogenous' character of technology – based

on human capital accumulation – have provided a central role to knowledge and especially to new knowledge production. Thus, the doctorate reflects an even higher investment in years of education and a further educational investment and human capital accumulation, which is assumed will entail benefits for its holder (Becker, 1964). As a result of policy makers' endorsement of this theory, an increasing number of PhD holders is observed worldwide (Cyranoski et al., 2011; Auriol, 2007), while policies at national and international level have encouraged increasing investment in research (EC, 2003a).

These theories have consequently underpinned significant developments in European policy. These include the Lisbon strategy and the so-called KBE, which link with higher education and research initiatives, relating them to economic growth and national competitiveness. In addition, evidence from OECD countries (Luintel and Khan, 2005; Gemmell 1997) show that

> *"on average the flow of new-to-the-world knowledge is likely to be higher in countries that engage more scientists and engineers in the knowledge producing sector" (Luintel and Khan,2005, p.22).*

However, the assumptions of human capital theory have been challenged and debated. While higher education expansion is a fact (Teichler, 2001), the relationship between employment, productivity and economic growth is still obscure (Ashton and Green, 1996). As Keep and Mayhew (2004, p.310) stated:

> *"The main assumptions that underlie the case for expansion have not been probed with sufficient rigor and major policy decisions have been made on evidence that is at best, incomplete and at worst, weak or contradictory".*

In the UK, there are no clear links between the proportion of the workforce with degrees and economic growth rates (Keep and Mayhew, 1996; Keep et al., 2002) or productivity (Wolf, 2003; Elliott, 2004). Evidence for Greece also shows that despite the increasing enrolment and attainment of higher education degrees since 1980s (Katsikas and Therianos, 2004), it is characterised by low labour productivity and slow employment growth while it has experienced robust economic growth (OECD, 2008). In light of comparative research from a number of countries, Brown et al. (2008, p.i) note that:

> *"the human capital assumption on which government policy rests is no longer fit for purpose".*

Thus, it is argued that a highly skilled workforce will not lead to national economic competitiveness, individual prosperity and social justice if all countries follow the same route (ibid) since the notion of competitive advantage, based on investment to education, will cease to exist. Thus, the KBE advocates are confronted with:

> *"evidence (that) fails to support the argument that today's economy requires a significant let alone exponential, increase in demand for highly skilled workers" (ibid, p14).*

From a human capital theory perspective and with the assumption that individuals are rational agents who aim at maximising utility, the pursuit of a doctorate can be perceived as an educational investment destined to provide better employment, low likelihood of unemployment, high financial benefits (lifetime earnings and wage premiums), good working conditions and job satisfaction after the PhD. Many studies on the impact of doctoral education

have investigated the monetary value of doctoral education (O'Leary and Sloane, 2004; Rudd, 1990; Williamson, 1981) overlooking non-financial benefits of the doctorate for its holder (see Raddon and Sung, 2009). After all, while the doctorate is perceived as instrumental for enhancing employment prospects, many studies have found that the motivation for a doctorate is primarily intrinsic triggered by personal interest of researching a topic in depth (Vitae, 2010, 2012; Hodsdon and Buckley, 2011; Purcell and Elias, 2006).

Within this approach, individuals with the ability to choose the country and institution of studies would select the option that would provide better returns to their investment so that the benefits would be higher than the costs. However, there are some caveats to this assumption, especially in the case of doctoral education. Individuals might not be aware of the potential returns to the PhD, especially under the changing context of doctoral education in the labour market, as will be shown in subsequent sections. Considering that the PhD qualification requires a substantial period of time and is pertinent to specialised knowledge that can become obsolete especially in terms of the natural science and engineering (S&E), then employment prospects can be altered even during doctoral training. At a more collective level, human capital accumulation is claimed to entail macroeconomic implications implying a positive relationship between a highly skilled workforce and economic growth. However this has been challenged due to the lack of empirical evidence as highlighted earlier.

While many studies in Greece have explored the private returns to education (see for example, Tsakloglou and Cholezas, 2001; Papapetrou, 2006; Magoula and Psacharopoulos, 1999) and the link between human capital and economic growth (see Tsamadias and Prontzas, 2011; Psacharopoulos and Kazamias, 1985), findings suggest a positive relationship between educational investment and individual returns. PhD graduates have only recently been included in relation to education returns in Greece (Mitrakos et al., 2010; Prodromidis and Prodromidis, 2007) possibly due to the absence of data and labour market information about this highly skilled workforce in Greece and the traditional perception of the doctorate as an academic qualification. The human capital of the study participants is explored in terms of their earnings and job satisfaction by sector and country of employment – they are not compared with other educational levels – but also in terms of private returns beyond financial value, such as personal and professional development of the individual resulting from the doctorate.

2.3 Social capital

As Burt (2002, p.149) has remarked social capital is *"a metaphor about advantage"* and *"the contextual complement to human capital".* While human capital explains inequality in terms of individual ability (the highly able perform better at work, are more skilled), the advantage of social capital concerns relationships between these highly able individuals with further benefits (ibid). Social capital has been used extensively in a plethora of studies across various social sciences without a widely agreed definition of social capital (McClenaghan, 2000). This study draws from the approach of Bourdieu (1986)

on social capital as useful concept in understanding the potential effect of socio-economic origin linked often to educational choices and the influence of networks in doctoral education and subsequent employment.

Bourdieu (1986) introduced different forms of capital, such as economic, cultural and social capital. While economic capital is referring to fortune, property and income, cultural capital is distinguished by the embodied, the objectified, and the institutionalised state. The embodied state of cultural capital concerns the dispositions of the individual and the knowledge acquired over time, including the transmission of knowledge and capital from the family.

The objectified state of cultural capital is explained by the exposure to the extended cultural environment of the individual including books, paintings, music, etc. The latter state is exemplified through academic qualifications as a form of capital that entails benefits for their holders. Bourdieu (ibid, p.251) highlighted how economic capital can be converted into this type of cultural capital through an academic qualification that becomes a distinguishing factor, an advantage for the holder of the qualification in relation to other:

He also underlined how the value of academic credentials is not stable and might yield fewer benefits than expected especially under conditions of academic qualifications' inflation.

Cultural capital has been also pertinent to social class in Bourdieu's approach. From a sociological perspective, investment in education is a common way of achieving social upward mobility. While the reproduction of social strata is

facilitated through education, those in high socio economic class can afford more educational investments in their offspring. So, although education can contribute to social mobility, according to Bourdieu, individuals from high social class tend to possess and retain more cultural and social capital, which tends to lead to a reproduction of class inequality and dominance of the high social class (Brown, 2003). As Bourdieu (1974, p.32) has remarked, education contributes to the maintenance of social inequality:

> *[Education] "is in fact one of the most effective means of perpetuating the existing social pattern, as it both provides an apparent justification for social inequalities and gives recognition to the cultural heritage, that is, to a social gift treated as a natural one".*

While doctoral education represents the highest qualification acquired, the status of the PhD varies across different disciplinary, employment and national contexts (Triventi, 2011; Rudd and Hatch, 1968). Although previous studies have confirmed the effect of social origin and parental education on higher education access and selection of prestigious institutions (Deer, 2005; Boliver, 2006; Duru-Bellat et al., 2008), a limited influence of social background has been found on pursuing postgraduate education (Wakeling, 2009). Enders (2002, p.515) in a large scale survey of PhD graduates, found that educational and socioeconomic background of parents influenced access to the doctorate, but had *'little or no additional impact'* on the career paths. Nevertheless, belonging to a high social class with important social networks facilitates the accumulation of social capital through which advantages and privileges for the individual can be derived. According to Bourdieu (1986, p.248) social capital is defined as:

> *"the aggregate of the actual or potential resources which are linked to the possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition".*

His approach is focused on the individual and has been characterised as 'egocentric' (Wall et al., 1998), since the importance of social capital is dependent on the number of resources available to the individual or the magnitude of network contacts that can utilise with the view to gain individual benefits. Thus, a PhD graduate can yield benefits from a range of networks developed within the academic environment (supervisor, other professors, peers) or the wider scholarly community (in his/her subject area).

Bourdieu also introduced the concept of habitus, which can be used to denote the cultural differences between the different scientific fields. The habitus concept is defined as:

> *"a web of perceptions about opportunities and the possible and appropriate responses in any situation" (Walpole, 2003, p.49).*

This reflects perceptions, attitudes and dispositions of individuals that are developed continuously through the family and the surrounding environment. Although the habitus of Bourdieu has been primarily linked to the habitus of the elite social class (which shares common behaviours with the view to maintain its dominant position), demonstrations of habitus are evident in accessing networks under institutional forms such as a membership in an educational institution or a disciplinary group (Delamont et al., 1997a). Previous research has used the concept of habitus to reflect the norms and perceptions of different disciplinary cultures (ibid; Becher, 1981). Natural sciences and engineering – which is the disciplinary focus of this study – have shown

different cultural characteristics in comparison to humanities and social sciences including the social organisation in terms of supervision and doctoral training. Science doctoral education is traditionally arranged in research teams and groups (Leonard et al., 2006; Becher et al., 1994) where

> *"responsibility for supervision is delegated and shared between the generations of researchers"*[1] *(Delamont et al.,1997b, p.538).*

They have found that this 'social organisation' in sciences facilitates the transmission of dispositions and common perceptions to newly members of groups which constitutes the habitus of the discipline. Therefore, PhD students in these disciplines often assimilate the respective habitus. This involves not only peer support, knowledge and skills transfer from more experienced researchers that are critical for the PhD completion, but also can contribute to the understanding of the 'disciplinary labour market' and facilitate their transition into employment opportunities.

Bourdieu has been criticised for his lack of clarity, comprehensiveness and operationalisation of concepts, such as the cultural capital and its link to educational attainment and habitus (Tzanakis, 2011; Sullivan, 2001; Nash, 1999). In addition, the dimension of gender and non-elite individuals are overlooked in this approach (Schuller et al., 2000; Schuller, 2007).

Bourdieu has focused on the benefits of belonging in specific networks and groups while negative implications can be also inferred from social capital

[1] The authors based on a comparative study of socialization of PhD candidates emphasized the importance of postdoctoral researchers and senior researchers as a source of support for daily problems of PhD candidates in the lab sharing responsibility with the research director who is usually the formal supervisor utilised mainly for research direction by the PhDs.

when individuals are not part of these beneficial relationships. As Portes and Landolt (1996) have theorised:

> *"Social capital is a resource available through networks, then some individual and group claims will come at the expense of others".*

Lack of social capital can, thus, lead to exclusion and isolation to those that cannot access the structures, relations and groups (Szreter, 2000), while it can also hinder individual choices (Wall et al., 1998) that confer privileges otherwise.

From a doctoral perspective, the PhD qualification can be considered as a form of cultural capital recognised by the institution of doctoral education conferring a competitive advantage to its holder. It can be argued that the prestige of the doctoral education institution might further enhance this advantage, which is likely to be translated into higher status or elite employment and future career prospects in relation to PhD graduates from less reputable universities or non-PhD holders. In addition, Bourdieu (1986) has raised the importance of individual 'dispositions' and the importance of self-acquired knowledge – apart from the parents' influence – in the embodied state of cultural capital, which can mirror personal traits, such as ability, skills, personality, values, preferences or motivation. Such individual dispositions and characteristics are investigated in this study to identify their influence on doctoral education decision and career choices.

The cultural capital of Bourdieu also reflects the socioeconomic status of parents, which will be re-examined in this study[2] to understand the decision making processes of research. In turn, this is related to the choice of educational institution for doctoral studies and the type of doctoral funding, which are both examined in terms of their influence on the career trajectories of the participants beyond the PhD. The social capital embedded in social networks and relationships is also investigated as a determinant of employment choices since study participants are members of the PhD graduates' community, but also belong to various groups in terms of discipline, country of doctoral education and employment. Therefore, different forms of membership will be considered as to what extent they entail career benefits or drawbacks for the participants of this study. In doctoral education sphere, social capital benefits can be a transmission of doctoral knowledge and skills, career advice, employment opportunities through access to an extensive academic and professional network facilitated by the supervisor(s) and academic colleagues during the doctoral process.

Since this study is focused on careers, the individual – as highlighted in the human capital and social capital approach – but also the interaction of the individual with other people and the surrounding environment (networks, etc.) is a significant variable in career choices. Therefore, the next section outlines a coherent career framework that not only includes individual characteristics, but also social and environmental features and the interface between them.

[2] While the parental occupational background is provided in the survey, participants have also reported on the role of their family in pursuing a doctorate and deciding on their careers during the interviews.

2.4 Career theory: the systems theory framework

Career theories and frameworks also inform this study. Careers have been extensively investigated in academic literature leading to a plethora of different career theories. As Bimrose et al. (2005) have shown in a systematic review of careers' literature related to higher education students and graduates, that there is a continuous debate regarding career decision making and determinants of careers. In addition, nowadays, the world of work has altered significantly from the traditional organisational life careers of the past[3], thus the "*increasing complexity and changing patterns of employment and career"* needs to be considered in the investigation of current careers (ibid, p.2). Although a review of existing career theories is not within the scope of this section, a brief overview is provided in relation to theories and frameworks that are relevant to this study.

Career theories can be classified into process theories, content theories or theories that combine both (Patton and McMahon, 1999).

Content theories focus on the individual and its characteristics (such as personality, beliefs, values, interests) (Parsons, 1908; Holland, 1985), while process theories refer to the interaction between the individual and other contextual variables (such as labour market, socio–cultural environment) (Ginzberg et al., 1951; Super, 1957, 1980; Gottfredson, 1981)[4]. Furthermore, there are theories that combine the individual and contextual influences (Krumboltz et al., 1976; Bandura, 1986; Roe, 1956).

[3] In the past, employees would mainly stay within an organisation for their whole career.
[4] Patton and McMahon (1999, 2006) provide a good overview of these theories.

An overarching framework of content and process theories has been recently introduced by Patton and McMahon (1999, 2006), the systems theory framework (STF), which derives from the 'general systems theory' (GST), initiated by the biologist von Bertalanffy[5]. The GST was s further developed in different disciplinary spheres, such as in biology, anthropology, psychology, engineering and management (Bateson et al., 1956; Lewin, 1951; Ford, 1987; Sirgy, 1988). It was not until the 1990s that Patton and McMahon presented the systems theory in relation to career development[6].

Following the classification of theories that it encompasses, the STF is comprised of content and process features. The content influences[7] are included in the '*individual system'* and the '*contextual system'*. While the process influences refer '*to the recursive nature of the interaction between the individual and the contextual system'*, the '*change over time'* and '*chance'* (Patton and McMahon, 1999; p.155).

The individual has a central position in this framework as in previous career theories that the STF acknowledges and is built upon (Ginzberg, 1951; Gottfredson, 1981; Super, 1990). It comprises of various personal characteristics: values; ability; interests; beliefs; personality; self-concept; skills; world of work knowledge; gender; health etc.

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[5] Von Bertalanffy (1968) and Laszlo and Krippner (1998) provide more extensive accounts of the general systems theory.
[6] According to Paton and McMahon, they first introduced the systems theory in 1992 but it has been revised continuously until the 1999.
[7] Paton and McMahon clarify that they use influences – instead of factors – due to the dynamic nature of the word. Influences can be both good or bad helping or hindering career development.

The individual is considered as part of the contextual system, which is further divided into two systems: the social system; and the environmental societal system. The societal system is constituted by the social influences (such as family, peers, education institutions, workplace, media and community groups), which reflect the interaction of the individual with these. The environmental societal system depicts the wider environment that the individual resides and interacts. It is comprised of geographical location, historical trends, globalisation, socioeconomic status and employment market.

Looking closely at the systems theory framework (see Figure 2-1), all these content influences are drawn with intermittent hyphens to reflect their permeability to recursiveness, demonstrating that these influences from all systems are interacting in a way that can be

> *"nonlinear, acausal, mutual, and multidirectional as well as including the ongoing relevance of the past, present and future" (Paton and McMahon, 1999, p.163).*

Reflecting the developmental theories where careers were perceived to develop during life stages (Super, 1990; Ginzberg et al., 1951), this framework incorporates a time component that expresses the change of these influences over time, including life cycle events, historical or employment market trends. Finally, chance is also integrated in this theory to account for unexpected events that might occur at any level introduced before, and alter career paths such as a natural disaster, an accident or an economic crisis.

The systems theory also developed in response to refute the traditional positivist culture over a 'constructivist worldview' that would incorporate the

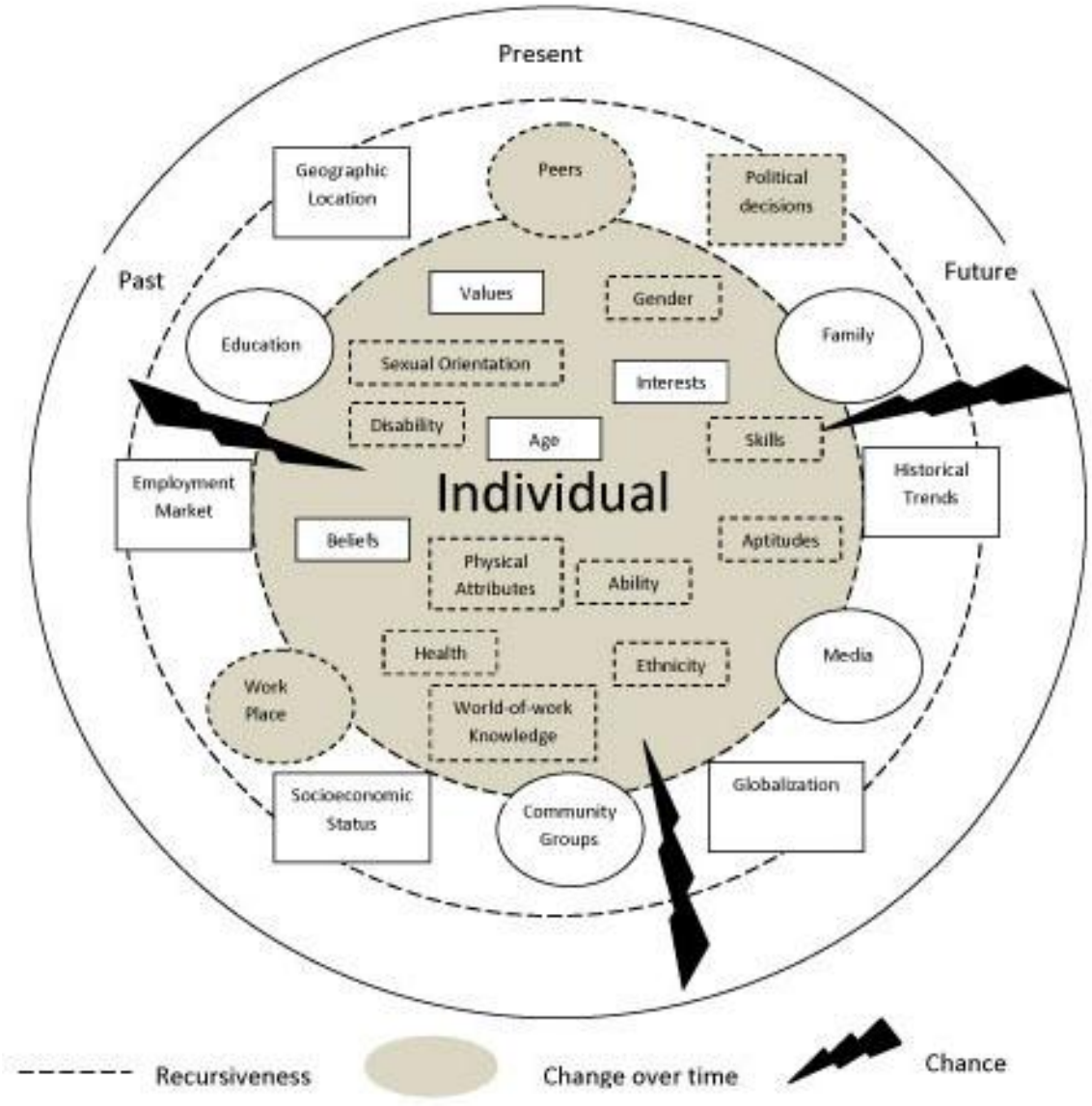
complexity of the current world. Through systems theory, it has been continuously highlighted how the interconnectedness and the interaction of the individuals with the environment/context around them are part of the meanings and perceptions they develop (Capra, 1975; Berger and Luckman, 1967).

The acknowledgement of the systems theory that individuals' careers cannot be explored in isolation and the individuals' perceptions derive from their interactions with different variables, its clarity and comprehensiveness are among the benefits of this framework for this study. McMahon and Patton (1999, p.167) identify as one of the strong points of this framework the 'richness' of STF in bringing to other disciplines:

> *"Principles from fields such as economics and political science can be incorporated in exploring the environmental – societal system. Thus the STF offers the potential for integrating psychological and sociological theories of career".*

This framework is used to contextualise this study by providing a frame for the determinants of the career paths of PhD graduates who participated in this study. Therefore, individual characteristics (such as gender, skills and interests) are taken into account while the interaction of the individual with the societal system is explored through doctoral education decisions. These decisions include the motivation for the doctorate, the choice of institution, the funding process and the relationship with the supervisor and how they fit in the career trajectories of the participants. The role of the family, peers and networks are also investigated in relation to the doctorate and employment decisions beyond the PhD.

Figure 2-1 The system theory framework (Patton and McMahon, 1999, p.164)



The interface between the societal and the environmental societal system is explored through the lenses of the academic and non-academic workplaces, the disciplinary labour markets within the macroeconomic and policy environment of Greece. The qualitative phase of this study confirms the

complexity of PhD graduates' careers and the interconnectedness of a diverse set of influences which determined their career choices. There was a constant interaction between individual and systemic influences where time and chance also played an important role.

2.5 Education and employment-led migration

The migration of the highly skilled has preoccupied research since the 1960s. However, it was in in the past decade that the concept of brain drain had emerged referring to geographical movements of highly skilled people from developing countries to more advanced economies aiming at better earnings and life conditions (Carrington and Detragiache, 1998; Khadria, 1991; Bhorat et al., 2002)[8]. There are two problematic areas in exploring this phenomenon: a deficiency in the amount and accuracy of data that allow for international comparisons; and the limited consensus over an internationally encompassed definition of the highly skilled. In response to this, the OECD in cooperation with Eurostat introduced (in the Canberra Manual[9]) the definition for Human Resources in Science and Technology (HRST):

> *"they have successfully completed education at the tertiary level in a S&T field of study"; or 'they are not formally qualified as above, but are employed in a S&T occupation where the above qualifications are normally required' (OECD, 2001, p.15).*

Within this broad definition, two groups are identified as significant to this research study in relation to qualification and country of employment,

[8] There is evidence that highly skilled migration is also observed between advanced economies e.g. Germans and French highly skilled moving to Luxembourg (Zimmerman, 1996), British scientists and academics moving to US etc. (Wilson, 1966).
[9] The Canberra Manual is 'an internationally agreed conceptual framework' (OECD, 2001, p.15; 1995) as a result of cooperation between Eurostat and OECD and the OECD group of National Experts in Science and Technology Indicators (NESTI).

including: the Greek PhD candidates that migrated to UK for doctoral education (student mobility); and the PhD graduates who remained abroad or left Greece to work abroad (job mobility).

2.5.1 Doctoral students' mobility

Knowledge economy, higher education expansion and globalisation have expanded opportunities for migration of the highly skilled (Altbach et al., 2009). The number of international students has been continuously increasing, reaching more than 2.5 million students studying abroad in 2005 compared to half a million students in 1975 (OECD, 2008, p.84). The critical role of mobile students has been highlighted by Mahroum (1998, p.177), "as *the main sources of workforce supply to the labour market and to local and global knowledge pools".* A substantial amount of research has been devoted to postgraduate students and early career researchers (see Mahroum, 1999; Finn, 2010; Ackers and Gill, 2005). Doctoral candidates are part of reserves of highly skilled human capital where future scientists and academics will be drawn from. As has been reported, "*one measure of a nation's knowledge base is its output of PhD students"* (King, 2004, p.314*).* Moguerou (2006, p.2) underlines the importance of investigating mobility of PhDs since they are highly mobile (OECD, 2002) facilitating beneficial synergies for the enhancement of scientific knowledge. Plus, their critical role is highlighted *"to the conduct of research and innovation in national innovation systems"* and the far reaching implications that their mobility might entail for economic growth for the home-host countries. This emphasis is reflected in the growing body of literature devoted on this group and its migration decisions (Kwok and Leland,

1992; Auriol, 2007; van Bouwel, 2010; Grip et al., 2008). Factors affecting the decisions for student mobility and choice of HEIs can be common to some extent between undergraduates and postgraduates (location, institutional reputation). Nevertheless, prospective PhD candidates attribute increasing importance on the quality of research groups and supervisors due to the nature of the doctoral degree (Fox, 2001) or the higher quality of training and increased employment opportunities after their PhD both in the home and host country (Delicado ,2010).

Science and engineering (S&E) graduates and PhD holders have been acknowledged globally, as a key part of a dynamic economic strategy. Due to the continuous technology advancement, there is a growing demand for a workforce able to understand and develop new technologies. Moreover, research in S&E has a pivotal role to play in the future of European economies emphasised at EU policy. The acknowledgement of the significant role of S&E can be identified in the 3% growth rate in the number of S&E doctoral degrees between 1998-2005 in EU-27 (EC, 2008[10]). The focus of academic research on this group is explained by the increasing significance of human capital for R&D and innovation contributing to national competitiveness and knowledge based economies (Freeman, 2005). In addition, migration becomes more of an urgent matter considering what Chompalov (2000, p.32) has reported:

> *"Natural scientists have a higher propensity to emigrate than social scientists because their knowledge is more readily convertible".*

[10] For more see the following EC(2008) about careers and mobility of researchers.

2.5.2 Mobility of scientists and academics

The migration of scientists and academics has been an important subject of research enquiry (see for example Johnson and Regets, 1998; Mahroum, 1999). Migration studies have traditionally focused on scientists and academics since mobility and international networks have always been part of academic and scientific life (Mahroum, 1998). While economic models have been employed to explore the relationship between established scientists' mobility decisions and productivity[11] (Hunter et al., 2009; Kwok and Leland, 1982), limited research has been devoted to exploring the determinants of the migration decisions of this highly skilled workforce. Economists have explored highly skilled migration in relation to human capital theory, using the term *'human capital flight'* (Rappoport, 2006; Haque and Kim, 1995). This differs from 'brain drain' as it adopts a rational choice approach according to which individuals decide to migrate because they expect higher earnings or better conditions in employment (Faist, 1997; Massey et al., 1993; Grogger and Hanson, 2008). Zimmerman (1996) based on macroeconomic theory of supply-demand, concluded that most mobility in Europe was driven by supply push rather than demand pull issues. While such considerations are influencing migration, they do not adequately address the complexity of this issue. Context has been found to bridge the gap between the range of difference considerations (social, economic and cultural), which plays a rather

[11] These studies concentrated on 'elite' scientists such as highly cited researchers, with Nobel prizes in economics and physics. While Kwok and Leland found a positive relationship between the mobile scientists and the average productivity, Hunter et al, did not find a strong relationship between the two for the physicists they examined. It should be mentioned that they had a small sample of 158 people.

critical role in acquiring a more comprehensive overview of migration experiences (Castles, 2010).

Compared to other groups of highly skilled migrants, scientists and academics differ in the factors influencing their mobility decisions. Mahroum (2003, p.17) has argued that the migration of scientists and academics is determined *"apart from economic, personal, or political factors, science specific factors such as prestige, recognition, and credibility"*. Therefore, this specific group attributed high importance to institutional characteristics – the university or the organisation where he/she will be employed – which will potentially enable them to fulfil their research and personal aspirations in contributing to scientific knowledge. A recent qualitative European research comparing researchers in different sectors highlighted the critical role of research related factors such as '*personal research agenda'* and '*prospects in scientific career'* as the most important motivations for researchers' mobility in academia(EC, 2010). Personal and family factors acted more as preventing rather than driving mobility while financial incentives were considered significant considerations for mobility for industrial researchers (ibid). However, this study was merely descriptive without referring to systemic factors that might have influenced the mobility decisions of researchers as some Italian studies do (Constant and d'Agosto, 2008; Censis, 2002). Such studies focus on scientists and academics living abroad and emphasise structural considerations as push factors of migration such as the "lack of research funds in Italy" and the limited availability of opportunities to get intrinsically rewarding careers allowing them a scientific career in their filed. Morano-Foadi (2006) echoed similar concerns

on a qualitative study of Italian scientists in the UK who appreciated the meritocratic procedures in the UK academic system and the better working conditions (salary, vacancies) in combination to a better research reputation of systems abroad than the Italian one. Italy and Spain share similarities with Greece regarding low spending on research and characteristics of the academic systems as Millard (2005, p.352) reported based on findings from a European study of Marie Curie Fellows:

> *"Reasons for leaving countries such as Italy, Spain and Greece included under-funding of science, bureaucratic career structures, and lack of openness and transparency in recruitment".*

2.5.3 Greece: PhD students and graduates leaving their country

Greece is one of the main suppliers of two types of skilled people, skilled professionals and students for the west countries for mostly the US and the UK,It has been reported that Greek students are the most mobile among their European counterparts:

> *"In absolute terms, we find that 4,000 Greeks, 3,900 Germans and 3,600 Italians are pursuing doctoral studies in a Member State other than their country of citizenship." (Moguerou and Pietrogiacomo, 2008, p.77)*

Of course the significance of these statistics is further underlined considering that Greece is a small country of 11 million residents. In addition, Greece had one of the highest ratio (17.8%) of expatriate doctoral candidates in 21 European countries to the total number of doctoral candidates in the country[12], consequently 17.8 doctorates were conferred to Greek citizens for every 100 doctorates granted from Greek Universities in 2005. Similarly, Greece also

[12] The data exclude Malta and Cyprus that have ratios such as 257% and 144% respectively because of the small number of doctoral candidates domestically.

contributes to the PhD graduate and scholar community of the US to a greater extent[13].

Many Greek graduates from foreign universities remain abroad to pursue, what is considered a more rewarding – both financially and socially – career outside Greece. As the EU Science and Research Commissioner Janez Potocnik said:

> *"Greece needs to invest more in research, infrastructures and reward systems in order to safeguard its most precious commodity: its researchers".*

He highlighted examples of Greek scientists[14] who have left Greece and Europe to pursue their careers in the US, referring to the 'Greek paradox' lying in the talented Greek scientists remaining abroad. This increasing trend of researchers and doctoral holders – educated within Greece or abroad – shows more investments towards developing highly skilled human capital and knowledge creation. Nevertheless, while there is evidence on R&D personnel on qualification level in Greece, there is no information[15] on foreign-educated doctoral graduates, whether they return to Greece and how they compare to their counterparts – PhD holders from Greek universities – in the Greek labour market. As Lianos et al. (2004) note:

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[13] Comparing the number of doctoral degrees granted in US with the number of doctoral degrees conferred from home universities, Greece has the second highest ratio with 8,6% meaning that for every 100 PhD graduates from Greek Universities, there are 8,6 doctoral degrees conferred to Greek citizens by US universities. In terms of foreign scholars in the US, it was found that in 2005-2006 Greece ranks 26th (with about 605 scholars) in the top 50 countries of origin [(China is leading, with Germany (5th) -5100, France (7th), UK(8th) with 3334 scholars, Italy(9th)] (Moguerou and Pietrogiacomo, 2008,p.104).

[14] He used the examples of Michael Dertouzos, former Director of MIT's Laboratory for Computer Science and Fotis Kafatos, Chairman of the Scientific Committee of the European Research Council, former Professor in Harvard University)

[15] Greek LFS provides figures for share in the public sector, self-employed but it does not capture research/academic/administrative posts within the public sector and also it does not distinguish doctoral holders from foreign universities

> *"no research effort has been devoted to examining how well foreign university graduates perform in the Greek labour market when they return home after completion of their studies".*

The authors reported that the majority of foreign-educated graduates were integrated in the Greek labour market within 18 months after completing their studies abroad, while less than half were employed in occupations that were not relevant to the subject of their studies. However, the results are limited since disciplinary differences and comparison with Greek University graduates was not allowed. In addition, it did not report on PhD graduates.

This study aims to provide further information on Greek PhD graduates who pursued their studies abroad and how they compare to their counterparts, who studied in Greece, in terms of career development. Mobility is intertwined with educational and career decisions of the study participants and thus, it is explored in this study through the discussion on decision making for doctoral education and career choices. At the same time, mobility is employed as a criterion to compare different groups and understand the similarities and differences that these groups present in relation to their careers. For example, it will explore which factors affected doctoral education decisions for the Greek and UK-educated and how this education-led migration experience influenced the subsequent career paths and choices.

In this study, it is explored how participants with current employment abroad (both the ones who remained abroad and the ones who moved abroad after the PhD) compare to those that work in Greece (the ones who were educated and worked in Greece and the ones who returned to Greece after the PhD) in terms of job satisfaction with their employment and utilisation of the doctorate

in their career to date. What were the push and pull factors in their career decisions? To what extent personal or structural factors determine employment-led migration?

In the 2000s, the brain drain was reconsidered since studies showed temporary character of movement and the repatriation of the highly skilled, enhancing knowledge transfer, introducing the notion of 'brain circulation' (Saxenian, 2000; Johnson and Regets, 1998; Kritz and Caces, 1992[16]). This has triggered research on return of highly skilled migrants to confirm whether migration can entail positive benefits for the home country (Regets, 2001; Gill, 2005). However, it is still a rather neglected area in academic literature, not least due to the difficulty in collecting relevant data (Saxenian, 2002; Moguerou, 2006; Kobayashi and Preston, 2007). Gill (2005) and Delicado (2010) found that there was a great tension in the return decision of scientists and students to their home countries between structural barriers pushing away from home (e.g. under-funded research in academic and private sector, lack of meritocracy) and personal reasons pulling them back (family ties, quality of life, culture, food and climate). Since these issues are explored in the qualitative stage of this study, it is also investigated to some extent whether and under which conditions participants considered returning to Greece in the future to understand further the related barriers and incentives of such a decision.

[16] They use the example of Malaysians who after studying in Australia, they returned to their country contributing to knowledge transfer activities.

2.6 Previous studies on PhDs

2.6.1 The origins and criticism of the doctorate

In the past, the doctorate was the qualification required, in order to acquire the right to teach in a university, in a specific subject (Noble, 1994, p.8-9). Nevertheless, the doctorate was not seen as a degree for research as such, though original work and public defence of original contribution was necessary for being awarded the license to teach. It was not until the 1800s with the founding of the University of Berlin by Wilhelm von Humboldt, and the emergence of the 'classical' German research university, that the PhDs started being considered as modern research-based degrees. The so called Humboldtian model has often been identified with the research university model (Anderson, 2000, p.5). However, Humboldt had stressed the unity of teaching and research – and not the predominance of one over the other – which can be found in his views about the four important pillars for a modern university (Ash, 2006)[17].

In the 1950s-1960s research was acknowledged as a catalyst for economic growth and became a priority in governmental agendas. An increasing trend of new doctoral programmes and studentships were thus introduced, especially in the UK and US, followed by the establishment and expansion of doctoral programmes in other European countries, in the 1960-1970s. State

[17] As reported by Ash (2006,p.246), the four pillars for a modern university according to Humboldt are : (1) the integration of teaching and research, including the obligation to foster the creation of knowledge as well as its preservation and transmission; (2) the complementary principles of Lehrfreiheit (freedom to teach) and Lernfreiheit (freedom to study); (3)the demand for Einsamkeit (solitude) and Freiheit (freedom) in the autonomous pursuit of truth; and (4) the introduction of the seminar system as the backbone of a community of teachers and students ('Gemeinschaft der Lehrenden)

governments boosted their research expenditure in an effort to increase the number of doctoral programmes, whereas the universities were assigned to manage and organize these programmes. Naturally, more governmental funding led subsequently to a further need for evaluation and monitoring whether the doctoral investment fulfilled the defined goals. This scrutiny exposed the related problems and challenges concerning doctoral education, such as the prolonged study duration and the high non-completion rates which preoccupied many academics in the US (Baume and Amsterdamska, 1987; Winfield, 1987; Colebatch, 2002; Bowen and Rudenstein, 1992)[18]. At the same time, the purpose of the PhD as a passport to academia for promising students started to be questioned (Leonard, 2000). Taylor and Beasley (2005) discuss the change of the PhD on four main grounds. Firstly, as soon as research and education were acknowledged as catalysts for further economic growth, doctoral education was seen as an important factor for economic advancement. Therefore, the selection of research topics had to encompass doctoral students' research interests , the whims of supervisors/professors, and the needs dictated by governments, industries and the private sector. Coupled with the point of addressing societal needs, PhDs encouraged to undertake interdisciplinary research, which was seen crucial for solving complex research problems. Thirdly, the outcome of doctoral training was to generate academics. The transition from elite to mass higher education and the proliferation of first degree numbers, resulted in a significant increase of PhD output (Enders, 2004). This along with the decreased number of tenured

[18] These studies indicated that since the 1980s around half of the population of doctoral candidates actually graduated with a doctorate.

academic posts – due to governments in Western Europe and the US reducing expenditure in higher education in the 1970s-80s – led many PhD holders to search for a job outside academia. However, PhD graduates did not always succeed in fulfilling their career aspirations beyond academia, since it was found that PhD graduates either accepted a position that often required less qualification or they could not find a job. Consequently, doctoral programmes were accused of not offering the skills and competencies needed for employment outside academia.

Finally, doctoral education training was also questioned in terms of providing the necessary skills and competencies that the PhD graduates should be equipped with, for responding to the expectations and demands of the future 'knowledge economies' (Usher, 2002). Societal transitions from industrial to information society and currently to a knowledge-based society seem to dictate that PhD programmes should produce research entrepreneurs and not traditional academics. These are the outcomes of the so called two modes of knowledge production that Gibbons et al. (1994) and Novotny et al. (2003) have argued. While mode one reflects the traditional PhD which aim in producing academics-specialists, who conduct research to satisfy their disciplinary interests, mode two emerges to meet the needs of a knowledge-based economy and society. According to mode two, researchers both in academia and beyond undertake research as entrepreneurs, organising research, providing their expertise and market the final product to satisfy societal needs.

Although Taylor and Beasley (2005) refer to the future knowledge-based society and raised important points about doctoral education, they had not addressed the policy discourse especially at European level, which is discussed next.

2.6.2 The policy discourse on doctoral education and the knowledge-based economy

The first effort undertaken at European level in the field of postgraduate education was in 1990 with the establishment of Committee for Postgraduate education[19]. This Committee recommended the adoption of the American system in Europe so as to decrease the duration of postgraduate studies (Kivinen et al., 1999). An OECD report in 1995 based on an international review of postgraduate education concluded that the objectives and functions of the doctorates have been reconsidered and the traditional path for an academic career in research and training was being questioned.

The limited information on the doctoral labour market was also highlighted in a European conference in 1996 (Frijdal and Bartelse, 1999)[20] and thus the rethinking of structure and organisation of postgraduate studies was reinforced (Kivinen et al., 1999). But, this required more systematic information for European postgraduate developments. More specifically, a common language, a more precise terminology and a conceptual framework were necessary in

[19] Ministers from Belgium, Netherlands, France and Germany, responsible for Science and Education decided to establish a Temporary International Consultative Committee of New Organizational Forms of Graduate Research Training aiming at the adoption of the successful graduate education system in US.

[20] In 1996, a European conference regarding *The Future of Postgraduate Education in Europe*, was organised by the European University Institute in Florence[20]- in collaboration with the European Commission's DG VII.

order to address the postgraduate problem. The organisation and the structure of postgraduate courses as well as the postgraduate labour market needed to be addressed in terms of gathering updated and reliable information on these issues (Kivinen et al., 1999). 1998 a European postgraduate network (PG Network)[21] was established with the objective to explore governmental education policies and elaborate on perceptions of higher education institutions (HEIs) and the labour market outcomes of postgraduate education[22].

In 1999, the Ministers of Education and university leaders of 29 countries launched the Bologna Process, with the aim to create a European Higher Education Area (EHEA) by 2010[23] and enable national educational systems to be connected. An important objective defined in the EHEA was the adoption of a system of degree structures based on two cycles[24]. It was not until the Berlin Communiqué in 2003, that Ministers considered it necessary to go beyond the present focus on the higher education cycles to include the doctoral level as the third cycle in the Bologna Process.

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[21] This network was organised due to the initiative of RUSE (Research Unit for the Sociology of Education) in Finland, and brought together researchers from eight countries (Finland, France, Germany, Hungary, Italy, Portugal, Netherlands and the UK).

[22] The work of this network is reflected on the book of Kivinen, Ahola and Kaipainen 'Towards the European model of postgraduate training' – very much focused at the graduate mode l – which gives an overview of the European postgraduate expansion with the various challenges in different countries.

[23] For an overview of the Bologna Process see: Joint Declaration of the European Ministers of Education (1999) The Bologna Declaration. The Bologna process is an intergovernmental initiative which does not aim in harmonization of national educational systems but on identifying tools for linking them. This process has been a successful initiative at European level considering that each country- and its higher education community- participate on a voluntary basis. This reform has been encompassed by 46 countries willing to engage to the objectives and principles underlined in the European Higher Education Area.

[24] The first cycle refers to the Bachelor degree while the second cycle concerns the Master's degree.

As Thorlakson (2005) argues, this decision was an effort to raise the issue of the academic labour market. By making degree structures more comparable, the qualifications of doctoral holders could be examined whether they are sufficient for employment outside academia or they lack the necessary ‘required to form part of a skilled European workforce for the knowledge based economy.

The notion of knowledge-based society has been first conceived by the OECD in 1996[25] and it was not until 2000, that the Lisbon strategy consolidated its position in European Politics. In this context, the governments of the EU Member States agreed on the importance of higher standards of education and research for building a new economy based on knowledge (Rodrigues, 2003; European Commission, 2005). This ‘knowledge-based economy’ (KBE) relies on the commoditisation of knowledge, which in turn demands a better educated workforce and excellence in research, to guarantee a competitive advantage to the EU in the world economy. Therefore, it requires proper training and necessary skills acquired through doctoral programmes in a way that they should meet the expectations for the future knowledge-based workers (Usher, 2002). With PhD graduates as part of this workforce, doctoral training is reconsidered to meet new needs. Thus, the current shape of the doctorate is being determined by economic considerations.

Academic literature has been extensive on the notion of KBE and its impact to European policies on employment, education training and research &

[25] OECD (1996) in Leydesdorff (2006, p.189).

development (R&D) (Lindley, 2002; 2003). Thus for the policy-makers, R&D investment is considered as the main route to economic growth and socio-economic development, and a crucial component of the Lisbon objectives. The Lisbon strategy (Presidency Conclusions, 2000) aims to constitute European Union by 2010 as

"the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion".

Therefore, in 2002 the Heads of State agreed to devote 3% of GDP to R&D by 2010 and acknowledged the need for the private sector to provide funding reaching 2/3 of the R&D expenditure (Presidency Conclusions, 2002)[26]. European governments have been engaged to enhance R&D activities through various policy mixes (Warda, 2002[27]; Griffith, 2000; European Commission (EC), 2003a) among which to focus on human potential.

The importance of human capital (and what is more of the production of PhDs) is reflected in the development of two composite indicators by the EC to capture the 'knowledge' dimension[28] of the KBE. The indicators on investment and performance in the KBE are comprised of a number of key variables, including the number of researchers per capita, PhD graduates in S&T as knowledge creation sub-indicators.

[26]See:http://www.fondazionecrui.it/eracareers/documents/research_policy/Barcelona%20EUCouncil%202002.pdf.

[27] Policy mixes are proposed such as: increased funding on governmental research centres, universities or business R&D units, economic incentives for stimulating more R&D activities (e.g. favourable tax treatment, R&D subsidies), establishing patent protection frameworks.

[28] Three aspects of knowledge have been emphasized: knowledge creation, knowledge dissemination and knowledge.

In 2000, the European Commission (2000) proposed the creation of a European Research Area (ERA) to prevent current research fragmentation across Europe, foster a European space of research and facilitate mobility and international cooperation of researchers. The ERA aims at creating an area where all the researchers can move freely, cooperate and work efficiently by establishing research networks meeting the continuous, economic and technological challenges and social needs of the contemporary world. Fostering excellence, developing sustainable and diversified funding are becoming important prerequisites for the realisation of the ERA.

Doctoral education and researchers have come to the fore of European and national developments highlighted by the various initiatives undertaken: European charter and code of researcher and OECD Careers of doctorate holders (CDH project).

More recently, a 2020 vision for the ERA was adopted by the competitiveness council in 2008. A major element of this vision refers to the '*fifth freedom',* free circulation of researchers, knowledge and technology. This vision envisages a close cooperation of various levels of stakeholders such as individual researchers, SMEs and multinational firms, universities, funding organizations, society and policy bodies at national and European level and of these stakeholders in order to foster sustainable development but also act as a leader in the global research world (EC, 2008).

The emphasis of European higher education and research policy on doctoral education and its outcomes outlines the importance attributed to PhD

graduates and explains the reasons for being the focus in this study. Many studies have highlighted their critical role in knowledge production as important agents in the triple helix model (Etzkowitz and Leydesdorff, 1997; Usher, 2002; Mangematin and Robin, 2003).

2.6.3 Previous literature on PhD students and graduates

Despite the increasing emphasis on the critical role of the PhD graduates in the knowledge-based economy and the growing body of research on doctoral education and its outcomes, it is still perceived that it is an under-researched area especially compared to undergraduate education (Raddon and Sung, 2009; Park, 2007).

As discussed, the criticisms of doctoral education have precipitated the need for further accountability of the HEIs in relation to doctoral education raising thus the importance of tracking the PhD population during and after their studies exploring whether public investment is justified. Tracking activity was often initiated by HEIs or governmental agencies and research institutions which conducted such studies of PhD graduates at national/institutional level with different rationales and different methodological tools in Finland, France, Norway, the US and the UK[29].

The changing context of doctoral education has attracted a great academic interest during the 1990-2000s in the US (Noble, 1994; Taylor and Beasley,

[29] The respective agencies that undertook these studies were: UK (HESA – Destination of Leavers from Higher Education and the longitudinal DLHE (L-DLHE)), France (CEREQ – Generation Surveys), Norway (NIFUSTEP), Finland (AKAVA, Tilastokeskus, Aaresaari), US (NSF).

2004), Europe (Enders, 2002, 2004, 2005; Kehm, 2007; Park, 2005; 2007; Mangematin, 2000; Mangematin and Robin, 2003) and Australia (Tennant, 2004; Usher, 2002; Harmann, 2002; Neumann, 2002) especially under the increasing importance of these 'knowledge workers' in the KBE. Therefore, a growing body of research on the career paths of PhD graduates has emerged, influenced also by the availability of data on this highly skilled workforce. Thus, many studies have been undertaken on career paths of PhD graduates in US, Europe and Australia (Nerad and Cerny, 1999; 2002; Golde and Dore, 2001; Bowen and Rudenstein, 1992; Morrison et al., 2008; Freeman and Gorroff, 2009; Rudd, 1984; Purcell and Elias, 2006; Vitae, 2010; Enders, 2002; Calmand, 2011 Neumann and Tan, 2011).

Whereas, previous studies have focused on outcomes of doctoral training, they do not tend to take their enquiry beyond particular institutions, a single Member State (Enders, 2002; Moorgat, 2011; Schwabe, 2011; Vitae, 2010; Calmand, 2011), or particular subject areas or academic disciplines (Mangematin, 2000; Mangematin and Robin, 2003; Robin and Cahuzak, 2003; Rudd; 1990; Spencer et al., 2005; Nerad and Cerny, 1999; Morrison et al., 2008).

At international and European policy level, an increasing body of data have also been generated through empirical studies conducted by interested parties relating to doctoral research in Europe such as the European University Association (EUA), OECD, UNESCO, and the European Commission. Many of these investigations while opting to provide a European overview of

doctorates, tend to be case-studies with fairly limited aims such as establishing the number of doctorates awarded, the variety of different structures in doctoral programmes or reproducing the picture painted by national statistical figures (EUA, 2007; OECD, 1995). However, even where a comparative study (Kivinen et al., 1999) does take place, there is no pan-European dimension. A variety of methodological tools, often accommodating the peculiarities of the national higher education system, does not allow the compilation of comparable data. This concern was reflected in the recent initiative of OECD (2007) to focus on the Careers of Doctorate Holders (CDH). This project aims at improving the national capacity of OECD countries to collect information on recipients of doctoral degrees with the ultimate goal being to develop a harmonised system of indicators on careers and geographical mobility of the workforce using existing systems in Canada and the US as models. Based on national data collected through this initiative, academics have explored the career paths of PhD graduates at national level (Moortgat, 2011; Schwabe, 2011) while comparisons have been made available at international level (Auriol, 2007, 2010). In addition, a unique study was recently conducted in 2008-09 and published in 2011 by The European Council of Doctoral Candidates and Junior Researchers (EURODOC) which addressed conditions and employment preferences of doctoral researchers at European level. However, due to a limited number of responses in specific countries, the analysis of the survey includes only twelve European countries and is merely descriptive[30].

[30] A unique research study was conducted in terms of its European coverage. There were

While academic literature has been rather extensive on rethinking and reframing doctoral education (Park, 2007; Enders, 2004; Usher, 2002;) and international interest is growing on the outcomes of the PhD on the labour market (Enders, 2002; Kivinen et al., 1999; Nerad and Cerny, 1999; 2002; Paul and Peret, 1999) a rather limited body of academic literature has been concerned at Greek level (Galanaki, 2002).

There seems to be of limited interest to the Greek academic community and policy makers, not least because tracking of doctoral graduates is a time consuming and expensive task. In Greece, only one study has been recently undertaken with the view to build a comprehensive database of PhD graduates (for the period 1995-2005) and explore their employment trajectories at the same time. This research yielded about 4.000 responses, but it was noted that the sample was not representative of the population (GSRT, 2008, p.91, see more Appendix IV). The final report is rather descriptive based on quantitative data only. In addition, studies (Mitrakos et al., 2010; Livanos, 2008; Tsakloglou and Cholezas, 2001) have used LFS data (on small samples of PhD graduates), to explore the Greek labour market in terms of relative earnings of PhD graduates. However, there is no research undertaken in Greece that allows the further investigation of career paths of doctoral graduates. Previous Greek graduate surveys tend not to take their enquiry beyond first degree graduates in specific disciplines (Kougioumtzaki and Kalamatianou, 2008) or

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about 8900 responses from 30 countries in Europe, but the published report includes responses from only twelve countries (7500 responses), with Greece not being included.

particular institutions (Laboratory of Industrial and Energy Economics, 2001). Thus, there is scope for further examination. This study, considering the limited research on Greek PhD graduates, aims to elucidate the career paths of this workforce using both qualitative and quantitative data.

The labour market for PhD graduates and career paths

The PhD has been traditionally perceived as a qualification required for pursuing an academic career, but this has changed in the past decades with the doctorate preparing graduates for multiple career paths (EC, 2003). PhD graduates enjoy low unemployment rates in comparison to other graduates worldwide with the majority being satisfied with their careers (Auriol, 2010; 2007; Nerad and Cerny, 2002; Calmand, 2011; Vitae, 2010). The doctoral labour market seems to be characterised by two features: high segregation (Calmand, 2011; Lee et al., 2010) and temporary academic/research contracts especially in the early career paths of PhD graduates (Auriol, 2010; Robin and Kahuzak, 2003; Kehm, 2006). The high uncertainty and job insecurity in the doctoral labour market is a common phenomenon in many countries although its extent varies in terms of disciplinary and national context (Auriol, 2010, p.13). The proportion of doctorate holders confronting these unfavourable working conditions five years after their graduation[31] reached 60% in Slovak Republic and over 45% in Germany, Spain and Belgium. PhD graduates in natural sciences and engineering were less likely to work under a temporary

[31] The reference year was 2006.

contract compared to their counterparts from humanities and medical sciences[32].

Auriol (2010) reporting on the doctoral population (1990-2006) of fourteen OECD countries demonstrated that the PhD is still perceived a passport for academic careers since PhD graduates were mainly occupied in the higher education sector. Nevertheless, there is a high share of this population in the business enterprise sector in the US, Belgium and Austria while the governmental sector absorbed a big proportion of doctorate holders in Bulgaria, Spain, Romania. In the UK, almost half the PhD graduates were occupied in academic occupations three years after graduation (Vitae report, 2010). According to the Greek study on doctorate holders (GSRT, 2008), the majority of them were found in the higher education sector (41%) and the public sector (24%) – including working as a researcher in public research institutions – with a small proportion of this group being self-employed (13%) or working in the private sector (12%). Smaller scale studies have also used this sector classification approach with a view to ascertain patterns and differences between these sectors (Purcell and Elias, 2006; Cruz-Castro et al., 2005). Though this research provides important information for doctoral employment by sector, it does not disclose information on the career paths that PhD graduates follow and their reasons for their career choices.

[32] 25% of PhD graduates in medical sciences and humanities were in temporary contracts while the respective percentage was only 7% and 12% for the engineering and natural sciences respectively.

To enhance this information, employment sector and occupational data have been undertaken by a few studies suggesting career typologies (Vitae, 2010; Snape et al., 2001; Calmand, 2011). Although these typologies are useful, they are very generic in their effort to provide an overview of PhD graduates' employment and identifying reference groups for comparisons of working conditions between the different strands.

Determinants of careers of PhD graduates

Although information on career paths is important to understand in which sectors and occupations PhD graduates are absorbed, it is rather critical to examine the reasons behind these career choices. Previous studies have raised the significance of the following determinants for career paths of scientists, academics and PhD graduates: doctoral education characteristics (funding, supervision, institutional choice, doctoral experience), record of publications, discipline of doctorate, personal characteristics (motivation, career orientation, gender) and labour market considerations (economic and social context).

While many studies have emerged on careers of PhD graduates, factors that potentially affect these careers have not been often a focus of enquiry. In French studies, the choice of doctoral education institution and the related 'organisation of research' which includes the type of financial support, the supervision relationship, the institutional choice and work experience during doctoral studies, has been found to have a significant influence in PhD career trajectories (Calmand, 2011; Giret and Recotillet, 2004).

Doctoral funding has been well researched in relation to PhD completion (Bowen and Rudenstein, 1992; Enhrenberg and Mavros, 1995) and justification of public investment (DTZ Consulting and Research, 2006; Purcell and Elias, 2006; Recotillet, 2007; Giret and Recotillet, 2004;) but less so in relation to career paths. As Recotillet (2007, p.489) has remarked, the type of funding and doctoral institution *"are both signals of high selectivity for access to postdoctoral positions".* In addition, a US study (Hogan, 1973[33]) has reported a positive relationship between the quality of the graduate programme of the university and the productivity of academic researchers (in terms of publications). Publications have also been emphasized as an important determinant of researchers' career paths (Diamond, 2001; Levin and Stephan, 1991). It could be argued that these factors carry a greater bearing for those interested in academic careers.

Industrial funding or working in the private sector during the PhD has been found to affect career paths of PhD graduates directing them often to private sector employment (Beltramo et al., 2003; Mangematin, 2000; Recotillet and Giret, 2004; Thune, 2009). As Recotillet (2007, p.498) has remarked, *"the intensity of the relationship with firms is an important factor explaining the career paths of doctorates".*

The selection of doctoral education institution is also linked to the supervisor. The role of the supervisor has been highlighted in careers of PhD graduates

[33] According to his research, he found that a great proportion of articles in highly cited economics' journals have been contributed by PhD graduates in economics from a few graduates' programmes at prestigious institutions (e.g. Harvard) in the US.

since the networks and the reputation of the research supervisor can facilitate the transition of his/her mentees in an academic career (Mangematin, 2000). Beyond academia, supervisors might not fulfil their career mentoring duties due to the limited awareness of non-academic careers and their interest in enhancing their scientific visibility through the careers of their mentees which is confirmed to some extent by the preoccupation of PhD holders in the higher education sector (Mangematin and Robin, 2003; Goldsmith, 2000; Delamont et al., 1997b; Jackson, 2007).

Disciplinary boundaries should also be considered since various scientific fields are linked to different cultures and different doctoral education (Becher, 1994; Biglan, 1973) and sometimes different labour market considerations. The scientific field or the discipline of doctoral study has been found as a significant determinant of career paths of PhD graduates in the UK, France and Germany (Vitae, 2010; Calmand, 2011; Recotillet, 2007; Enders, 2002). Recotillet (2007, p.489) exploring the postdoctoral experience of S&E PhD graduates in France who did not follow public academic research careers concluded that "*the PhD graduates' labour markets appear to differ significantly depending on the discipline studied".* For example, PhD graduates in engineering or computer sciences were more likely to work in the private sector and were not as interested in undertaking a postdoc as PhD graduates in natural sciences were (Cahuzak and Robin, 2003).

In the US, Nerad and Cerny (2002)[34] found that postdoctoral appointments varied among disciplines in terms of the postdoc duration and number required for a tenure-track post. In this study, biochemists appeared in a rather disadvantageous position compared to other fields since postdoctoral appointments[35] – with long duration – were considered a requirement for their career delaying their transition into a permanent post in any sector, especially a tenure post in academia.

The self or individual is at the centre of the career as has been stipulated by many career theorists (Super, 1953, 1957, 1990; Holland, 1985; Mitchell and Krumboltz, 1996). Thus, apart from doctoral education features, Snape et al. (2001, p.26) reported that *"career orientation, personal circumstances, and labour market circumstances"* were found as factors influencing career trajectories of PhD graduates.

Gender has preoccupied scholarly research in relation to career choices (Thune, 2009; Nerad and Cerny, 1999) and barriers that women's careers face in academia (Sabatier et al., 2006; Fox, 2001; Etzkowitz et al., 2000; Asmar, 1999). Nerad and Cerny (1999) found that women they were often limited in their pursuit of an academic career by partner and family considerations. Whilst the number of female scientists has increased over the last few years

[34] This study is looking at graduates with a PhD awarded during 1982-1985 (10-14 years after their doctorate) in six disciplines: biochemistry, computer science, electrical engineering, English, maths and political science. The survey had a response rate of 63% including international and domestic PhD holders (6,000 PhD students from 61 research universities). The survey data were complemented by 64 interviews to provide contextual information.
[35] Nerad and Cerny (2002,p.2) characterised the postdoc for this group as *"as a standard component of careers in life sciences and common in physical sciences".*

(including Greece), they continue to be in less advantageous positions compared to their male counterparts especially in terms of academic ranking and, income (Fox and Stephan, 2001; Ward, 2001; McNabb and Wass, 1997; Maratou-Alipranti and Tsirigoti, 2009; Karamessini, 2006). This phenomenon persists according to the latest EU figures (EC, 2009; SHE figures)[36]. However, it has not been investigated how female PhD graduates are performing in their early career paths in the Greek labour market.

Although psychological approaches beyond the career theories discussed earlier are not within the scope of this study, the distinction of motivation into intrinsic and extrinsic to explain the reasons for pursuing doctoral studies is used. According to Ryan and Deci (2000, p.55) in their self-determination theory, *intrinsic* motivation refers to doing something because it is inherently interesting or enjoyable, while *extrinsic* motivation refers to doing something because it leads to a separable outcome[37]. These notions have also been used by studies that have looked at motivations for postgraduate study (Purcell and Elias, 2006; Walkering, 2009, Hodsdon and Buckley, 2011). Mangematin (2000) reported that the motivation for doctoral education in France varied among different fields, with engineering PhD graduates adopting an instrumental approach while their counterparts in arts and social sciences being driven by personal interest. This is in contrast to UK studies where PhD graduates were primarily driven by their personal interest in a subject area or

[36] The proportion of female academic staff by grade for 2007 was the following: Grade A: 11%, Grade B: 23%, Grade C: 32% and Grade D:39% while female academics represent 29% of total academic staff in Greece versus 38% of the EU-27 average.
[37] For more see Deci (1975) and Deci and Ryan (1985)

in research irrespective of field (Vitae, 2010, 2012; Hodsdon and Buckley, 2011; Purcell and Elias, 2006). However, in these studies, career related reasons were also indicated amongst the most frequently indicated motivations by PhD graduates. Concerns about limited information on in-depth studies of motivation for doctoral education have been echoed in both France and UK (Mangematin and Robin, 2003; Leonard et al.,2004).

Apart from doctoral education features and personal characteristics, studies have pinpointed the importance of labour marker circumstances (Spencer et al., 2001; Enders, 2002; Raddon and Sung, 2009), which many of the previous studies have overlooked[38]. A recent synthesis review of career choices and impact of PhD graduates in the UK (Raddon and Sung, 2009) has highlighted gaps in research on the careers of PhD graduates and concluded that in-depth examination of contextual factors that influence choice and opportunity is lacking. They also emphasised systemic issues (such as social and historical contexts) when exploring careers that can often be identified through in-depth accounts and personal career stories to explore changes over time (Raddon and Sung, 2009 citing Raddon, 2006).

The lack of empirical evidence on career paths of Greek PhD graduates in natural sciences and engineering is addressed to some extent by this study from both a qualitative and quantitative perspective. Taking into account the

[38] For example, in French studies (Mangematin, 2000; Calmand, 2011; Recotillet, 2007), the French labour market is not taken into account when examining career paths of PhD graduates. It is well known that in France engineers and business students – related to the prestige of the Grandes Ecoles and their focus on skills' training – enjoy favourable conditions in the labour market in comparison to graduates from other disciplines in terms of enjoying more permanent contacts and higher salaries. For more see:Calmand et al. (2009).

determinants shaping careers outlined in the previous studies, will be examined in this study to understand whether they are important for the Greek group of doctorate holders. In addition, emphasis will be provided on the Greek labour market circumstances not only as a result of the limited consideration of such a variable in preceding research but also due to the structure and the recent condition of the Greek economy.

The value of the PhD according to PhD graduates

The value of the PhD has been regularly examined under economic and financial lenses (O'Leary and Sloane, 2004). A few studies have tried to assign a financial value at the PhD by estimating the salary premium that a PhD graduate would have compared to less qualified individuals. Past research had showed that salaries of PhD graduates are similar to the salaries of graduates who entered the labour market instead of pursuing doctoral studies (Williamson, 1981). While it was expected that PhD graduates will reach the salary levels of graduates quite quickly, Rudd (1986) in his study of undergraduates and PhD graduates in S&E found that they did catch up but they did not reach much higher earnings than graduates. More recently, a study of O'Leary and Sloane (2004) based on UK LFS data (1994Q1 -2002Q4) reported that lifetime earnings of PhD graduates are higher than those of undergraduates[39]. O'Leary and Sloane (2004) concluded that earnings over a lifetime (the so- called graduate premium) was dependent on gender, subject

[39] Male PhD graduates enjoyed a premium of 31% while women benefited even more for having a PhD gaining a wage premium of 60%.

studied and qualification level of the holder[40]. The authors cautioned about the small sample sizes at PhD level but they concluded that the PhD was "*a worthwhile investment over and above an undergraduate degree"* (ibid, p.84) while women were profited to a greater extent than their male counterparts.

Apart from regarding the doctorate as an educational investment with a financial value in terms of earnings, it has been widely recognised that the acquisition of this qualification can be more valuable in non-financial terms (Nerad and Cerny, 1999). Casey (2009) looked at the value of the PhD beyond the individual contributing to 'externalities' in the working environment or the society where this highly skilled workforce operated – such as knowledge transfer between different levels of employees, enhancing social milieu, etc.).

Raddon and Sung (2009) have remarked the deficiency of information on the personal value of the doctorate together with the social and cultural impact of studying at this level in order to highlight the impact of PhD graduates. It has, thus, been acknowledged that there is limited evidence on personal and social impact of the doctorate through in-depth qualitative studies. Due to the absence of research on doctoral education and its outcomes in Greece, this study also explored the role of the PhD in the Greek context and its value not only in professional terms, but beyond. Therefore the adoption of mixed methods in this project allowed the investigation of not only the general picture

[40] In terms of disciplines, Business and Financial studies appeared to have the highest wage premium (20, 21%). Looking closely at natural sciences and engineering, a PhD in sciences had a moderate premium (almost 7.85%) while Engineering and Technology and Maths and Computing were positioned in the lower spectrum of the earnings premium with 4.97% and 4.78% respectively. In addition, a Masters in Engineering and Technology (7.76%) provided a greater premium rather than a PhD (4.97%).

of PhDs, but also to gain in-depth accounts of the career paths and the impact of the PhD. In this study, the value of the PhD is presented in terms of employment and beyond remuneration according to the participants of this study.

Studies on employers of PhD graduates

Apart from research on the supply of PhD graduates, Green and Powell (2007) have identified a gap in exploring the demand for such graduates. No previous research has been undertaken regarding experiences and perceptions of doctoral graduates and employers regarding the employment/recruitment of the former in Greece.

However, a number of UK studies have raised the importance of investigating the views and perceptions of employers, since the information on the availability of career paths of this particular highly skilled workforce will feed policy practice(Jackson, 2007; Purcell and Elias, 2006; McCarthy and Simm, 2006; Souter, 2005). While some studies have focused on employers' perspectives (see Jackson, 2007; McCarthy and Simm, 2006), others have incorporated perspectives from both employers and PhD graduates (see Purcell and Elias, 2006; Souter, 2005). Further research has been currently undertaken by the Council for Industry and Higher Education (CIHE) exploring the value of postgraduates and the views of businesses regarding postgraduates in the UK context (see CIHE, 2010; Connor and Brown, 2009). Most of these studies have been small-scale and selective rather than comprehensive in their coverage of the PhD graduate population, and none have focused specifically on natural science and engineering PhDs.

Jackson (2007) in a small study exploring the recruitment of UK PhD graduates divided his sample of employers into two groups: first, employers targeting PhD graduates for their subject specific knowledge and skills and second, employers seeking PhDs for the set of transferrable skills developed and acquired through the PhD. Similarly, Purcell and Elias (2006) in a study of ESRC-funded social science PhD graduates, made a binary distinction of two 'camps' of employers with the one targeting specific subject knowledge, while the other 'camp' of employers – which forms the majority – would recruit PhD graduates almost incidentally as part of their graduate intake. From the data of this study, it is clear that although the national context and the disciplinary context of this project was different (Greece versus UK in both cases, and natural sciences and engineering versus social sciences in the second study), a similar binary division could be used to make sense of the data.

Similarly, a CIHE study on the value of graduates and postgraduates by Connor and Brown (2009) identified two broad types of graduate intakes: generalist (recruitment of graduates in formal schemes); and specialist (recruitment of graduates in jobs that required specific skill or knowledge especially in scientific or engineering functions). In the latter sectors, PhDs were likely to have been targeted, but the recruitment was not through a formal scheme. It was more likely to be a one-to-one basis.

These studies introduce the broad classification of PhD graduates' employers based on why employers would recruit PhD graduates. Another CIHE study (2010) suggested a classification of employers who recruit postgraduates –

including Masters' degree holders and PhDs – on the basis of how employers look for postgraduates. It was evident that these two classifications were complementary and a potential consolidated version would help address the issue of why and how to recruit PhD graduates. The reason for recruiting PhD graduates is expected to affect the way that employers would look for them. If employers seek transferrable skills in PhD graduates it would seem natural to adopt more collective recruitment approaches targeting bigger pools of PhD graduates, such as prestigious universities and schools, attend or organise PhD events. In contrast, specialists are expected to use more individualised approaches such as sponsoring PhD students, using contacts with specific professors /disciplinary research groups. The data from the employers' study in this project will be examined to see whether this is confirmed.

In addition, views of Greek and UK employers are compared in relation the benefits and the added value that this highly skilled workforce brings to the workplace and their strategies in PhD recruitment. The Greek economy and labour market context – especially in terms of human resources and management practices outlined in chapter nine – informs this comparison explaining the differences between the two.

PhDs in the national context: to what extent they are deployed

As mentioned before, it has been suggested by economists that the increasing number of highly skilled individuals is linked to economic growth of national economies although limited empirical evidence has confirmed such a relationship. Similarly, PhD graduates as part of this highly skilled workforce have acquired a critical role in national research and innovation systems.

However, the increasing supply of doctorate holders is not a sufficient condition for this critical role to be fulfilled since it requires also favourable demand considerations for ensuring '*optimum deployment across Europe of scientific and technological capacities'* as outlined in the 2020 vision for the ERA:

> *"the supply of human resources in science and technology is in-line with the demand by public and private research players and the ERA contributes to the development of appropriate structures for the training and balanced circulation of scientific talent as well as for a favourable work-life balance". (EC, 2008, p.8)*

The growing body of accumulative data of PhD graduates at European and international level (Auriol, 2007, 2010) has confirmed the importance of matching the demand and supply of highly skilled. Recent studies in Austria and Belgium (Moortgat, 2011; Calmand, 2011) presented the careers of PhD graduates and concluded that the supply of PhD graduates has been greater than the absorptive capacity of the economy in both countries especially in terms of research occupations. The implications of such findings suggest that some doctorate holders are employed in occupations that do not require a PhD. This is evidenced in both cases of Austria and Belgium where approximately 30% and 22% of PhD graduates respectively (with a PhD awarded during 1990-2006) were employment in jobs not related to their doctorate (Auriol, 2010, p.14). Furthermore, in Belgium, this inability to deploy the workforce stimulated mobility encouraging PhD graduates to move abroad with a view to work in research functions.

Given the available information on the graduate labour market in Greece, it could be suggested that Greece resembles the previous country examples. Liagouras et al. (2003) concluded that the main obstacles in efficient deployment of highly skilled can be found in both micro (structures and characteristics of Greek firms) and macro-level (economic performance and the macroeconomic policies during 1980-2000) as discussed in chapter three. The limited R&D activities in Greece is used by Liagouras et al. (2003, p.415) as an example to demonstrate "*the incapacity of Greek firms to meet the supply of highly educated workers".* This incapacity is extended to the PhD graduates – both foreign and domicile educated- whose career choices and development is limited and is not based on their individual achievements and performance but rather on structural factors of the Greek economy as is illustrated below (Liagouras et al., 2003, p.415)

> *"Not only does Greece have an excess of PhD holders, but most of them graduated from well-known European and American universities and technical institutes. Thus, the fact that many PhD holders have no alternative but to wait to be employed by universities or public research institutes, cannot be attributed to the quality of their knowledge and skills […] the missing link here is not the supply of high-quality researchers but the incapacity of the economy and especially of the business sector, to absorb them."*

These findings are based on evidence about the economic and industrial context in Greece and the graduate labour market since there was no research undertaken in relation to PhD graduates. This study aims to explore whether this is confirmed by the PhD graduates and employers' data and to what extent the Greek state has deployed this highly skilled workforce.

2.7 Conclusions

This chapter has outlined previous research, the key historical and contextual backgrounds against which current research needs to be understood. It has also presented the theoretical contributions and the relevant issues for this study.

A brief overview of the doctorate and its criticisms provided an insight into the background of this qualification, as well as the emerging policy discourse that placed doctoral education at the forefront of innovation and economic growth. The lack of empirical research in Greece on this topic is highlighted while a growing body of existing studies – beyond Greece – regarding the labour market and the career paths of PhD graduates are reported identifying gaps in the literature. This study aims to address these gaps. Finally, findings of previous research that have informed this study are outlined including evidence on determinants of career paths, the value of the doctorate and the employers' view on PhD recruitment. Based on this literature review, issues and suggestions raised during this chapter are discussed and followed up later.

Chapter 3 NATIONAL CONTEXT: GREECE

3.1 Introduction

This chapter sets out the contextual background of this study, the Greek national context. It starts with an overview of the economic and industrial relations' situation in Greece before providing information on the research and higher education policies and systems that influence doctoral education in Greece. It also presents the research position of Greece in Europe, the Greek research system and relevant policy. Then, it explains the Greek higher education system and its general characteristics summarising the main policies. A comparison of Greek and UK doctoral education is employed, where possible, to highlight similarities and differences, which will extend the understanding of experiences of PhD graduates studying in Greek and UK universities. This chapter finishes by considering the postgraduate and doctoral labour market in order to illustrate its current situation and the lack of information regarding the Greek doctoral labour market.

3.2 Overview of the Greek economy

The economy of Greece is largely based on the services' sector, which accounts for 71% of total GDP, whereas the industrial sector reaches just 22% in contrast with European countries (which have large industry sectors). Agriculture remains an important economic sector for Greece (7%) (NSRF,2007).

While tourism, shipping and the food and beverages sector constitute dynamic sectors of the Greek economy, energy and ICT have been recently growing sectors. This is the result of liberalization policies dictated by the Greek accession to the EU and the Greek exposure to the international competitive environment. Although Greece has adopted various actions – mainly tried to escape from the past protectionist policies – to enhance its competitiveness (legal frameworks and creation of bodies for combating black market phenomena, competition distortion, establishment of foreign companies), it is still characterised by a restrictive regulatory environment for fostering competition (OECD, 2005). Plus, structural deficiencies of the markets do not enable Greece to ameliorate its economic and industrial performance (Oltheten et al., 2003).

The manufacturing sector in Greece appears to be disadvantaged in high added value sectors as European figures demonstrate, constituting a trend of de-industrialisation regarding the decrease of industrial units and employment (EC, 2003). The industrial sector is comprised of small and medium sized enterprises[41] that are mostly family-owned, unable to reap the benefits of economies of scale as big multinational firms. At the same time, the majority of

[41] The private sector is dominated by small enterprises with low turnover and low number of employees. According to PAEP (2003) 96% of private sector enterprises employ personnel up to 10 employees. Therefore the state intervenes with policies that would facilitate and enhance competitiveness and employment. The small size of the companies also limits – or to better say, does not allow the adoption of - policies undertaken within the enterprise especially regarding human resource management policies which could include recruitment and selection, training etc. According to the Foundation for Economic and Industrial Research (IOBE, 2007) in Greece, there is a duality of Greek SMEs manufacturing regarding assimilation of new technologies with a small proportion of companies investing in new technology and seeking highly specialized personnel while the majority of them are just readjusting their equipment depending on demand, looking mainly for middle or low skilled employees.

enterprises are more labour intensive (textiles-clothing, food-beverages-tobacco) than technology-intensive (chemicals, machinery-electronics), constituting Greece as a country that adopts rather than creates technology since private R&D expenditure is a costly initiative, unbearable for small domestic firms to undertake (ibid). According to a foresight report, manufacturing plays a strategic role for the future Greek economy for developing new technologies (in bio-technology, energy and informatics) and high added value products.

Trade (distribution and retail), hotels and restaurants, manufacturing industries and real estate property sectors employ a high proportion of employment, associated with a low and medium skilled workforce (Gavroglou, 2003). Sectors with high employment rates for tertiary education graduates are concentrated in engineering, computer science and telecommunications.

There is an informal economy[42] that accounts for 30-35% of the total economic activity in Greece (EIRO, 2009). While individuals are favoured in informal economy through opportunities for tax evasion and higher income (since the employers do not pay security and pension benefits) especially in self-employment, collectively, there are consequences at macroeconomic level increasing tax evasion and inadequate reporting.

[42] The informal economy can be distinguished into different types of economic activities such as 'legal and illegal activities' according to Katsios (2006, p.65). In this thesis, the focus is on 'legal' activities which belong to the informal economy – especially for self-employed PhD graduates – for purposes of tax evasion *' unreported income from self-employment; wages, salaries and assets from unreported work related to legal services and goods'* (ibid, p.65)

Although Greece had enjoyed a high GDP increase especially before and after 2004, the Greek crisis in 2009 has reversed the economic growth of the last decade. In 2011, Greece has negative growth increase rates in GDP and employment indicators (EC, 2011)[43].

3.2.1 Greek labour market

Following the composition of the Greek economy, an increasing share of the workforce is occupied within the services' sector (69%), while employment in primary and secondary sectors has dropped continuously (12% and 19%)[44] (EC, 2010, p.174)[45]. The Greek labour market is characterised by a low employment rate compared to the UK and the European average. However, Eurostat (2010) figures show that the employment rate has increased within the last ten years from 56% to 61.9%.

Table 3.1 Employment rate of Greece, UK and EU

%	1998	2003	2008
EU-27	61.2	62.6	65.9
Greece	56.0	58.7	61.9
UK	70.5	71.5	71.5

Source: Eurostat, 2010

Furthermore, there is a high proportion of Greek workforce in self-employment reaching 35.4% of the workforce in 2008, more than two times over the EU-27

[43] A national fiche on Greece was prepared by EU social partners on *'The implementation of flexicurity and the role of social partners'* where national social partners were involved in this study. Through this study, 29 national fiches were developed including the Greek fiche.
[44] These figures concern 2009.
[45] European Commision (2010) Employment in Europe. Luxembourg: Publications Office of the European Union.

(15.7%) (Kwiatkiewicz, 2011). According to Torrini (2005, p.673), this is linked to high corruption and regulation:

> *"Countries like Italy, Greece and Turkey, which combine high levels of regulation, taxation and a high level of the corruption index, have high self-employment rate."*

In terms of gender, although the employment rate has increased for women at national and EU level during the last decade, it is still quite low, compared to UK and EU-27. In 2008, 48% of Greek women were employed in contrast to 71.7% of Greek men[46].

Table 3.2 Employment rate by gender in Greece, UK and EU

	Men (%)			Women (%)		
	1998	**2003**	**2008**	**1998**	**2003**	**2008**
EU-27	70.3	70.3	72.8	52.0	54.9	59.1
Greece	71.7	73.4	75	40.5	44.3	48.7
UK	77.3	77.8	77.3	63.6	65.3	65.8

Source: Eurostat, 2010

Statistics on employment rate by educational attainment demonstrate a similar picture in Greece, UK and EU-27 with a higher employment rate of tertiary education graduates compared to individuals with a lower educational attainment level, primary or lower secondary education.

[46] This is complemented by evidence of the high unemployment rate of Greek women which was double compared to Greek men in 2008 (11.4% versus 5.1%).

Table 3.3 Employment rate (%) by educational attainment (2008)

	ISCED 0-2	ISCED 3-4	ISCED 5-6
EU-27	48.1	70.6	83.9
Greece	52.4	61.2	82.1
UK	56.2	75.1	85.3

Source: Eurostat, 2010

At the same time, Greece is characterized by a high unemployment rate between 8-12% in the past decade (1999-2009). Especially after the Greek crisis in 2009, unemployment has increased further reaching 16.3% in the second quarter of 2011.According to LFS data (ELSTAT, 2011) the unemployment rate for young people reached 32.9% (b quarter, 2011)[47]. In terms of education qualifications, university graduates and postgraduates present the lowest unemployment rates with 11.6% and 9.7% respectively[48] (ELSTAT, 2011).

The Greek labour market has been characterised in the last decade by high unemployment rate especially for university graduates. Graduate unemployment has been linked with transition difficulties or a 'mismatch' between:

> *"the spectacular demand for higher education and the relatively weak demand of the Greek economy for highly qualified workers." (Liagouras et al., 2003, p.423)*

This is in- line with other studies on graduate labour market (Karamessini, 2010; Thomaidou et al., 2009).The explanation given by Liagouras et al. (2003) is based on the poor economic performance of the country and the

[47] The respective rate for women is even higher reaching 28.3%,
[48] In the second semester of the previous years these rates were much lower with 8.1% for undergraduates and 7.4% for postgraduates

characteristics of the Greek firms. The majority of Greek firms are SMEs specialized in low tech manufacturing and services activities (Tsipouri and Liargovas. 1997). These firms tend to have management practices (Makridakis et al., 1997)[49] – especially when it comes to recruitment – that are not conducive to the recruitment of highly educated graduates. This results in higher education graduates being absorbed only partially by a few emergent dynamic sectors and predominantly in the public sector (Lyberakis and Pesmazoglou, 1994). Similarly, the Greek education system has been criticised for catering primarily public sector needs and its inability to produce graduates meet the needs of the Greek labour market (Katsanevas and Livanos. 2005; Kanellopoulos et al., 2003; Gladstone, 2002).

3.2.2 Industrial relations in Greece and trade union membership

Industrial relations in Greece have been determined by various factors such as the structure of the Greek economy, legislation, but also European and international developments (EIRO, 2009; Ioannou, 1999). Legislation has played a dominant role in defining employment relations in Greece including the rights for strike and collective bargaining, employment protection and firing (ibid; Kufidou and Mihail, 1999) [50]. As Burtless argues (2003), the high cost of firing stipulated in the legislation does not facilitate recruitment and increase of permanent number of personnel even when the demand is increasing. In that

[49] Makridakis et al, (1997) investigated the management culture of Greek firms concluding that there is a dualism of firms in Greece: the family owned firms and subsidiaries of multinationals following different management practices. See Chapter nine for more information.

[50] Employment rights are stipulated in the Greek constitution (1974, articles 22 and 23) including the right to strike, the right to collective bargaining while general conditions are defined by law and collective agreements. According to article 23 of the Greek constitution, the right to collective bargaining is stipulated as one of social rights:

situation, employers prefer paying overtime or offer temporary employment instead of permanent.

The trade union movement in Greece has been attributed characteristics such as *'state controlled'* and '*clientilistic unionism'*. The dependence of the unions on the government and their strong relationships with the political parties prevented the trade union movement becoming a strong and autonomous one, leading to inefficiency of the public sector and utilities. Thus, decisions were undertaken according to political considerations rather than enhancing economic growth and social development (Ioannou, 2000).

Trade union membership differs in the Greek private and public sector. The latter enjoys a high trade union density up to almost 100% while private sector is characterised by a decreasing union density (18% in 2007). This is justified to some extent by the dominance of micro and small enterprises since there are no trade unions organized in small companies with less than 20 employees[51]. The prevalence of the services' sector in Greece over the manufacturing sector – which has been traditionally characterised by strong trade unions – has decreased the importance of trade unions.

According to law 1876/90, there are four types of collective agreements that regulate salary and working conditions of employees: the national general collective agreement (EGSEE); agreements at sector level; company/plant level; and occupational and regional level. The EGSEE provide a regulatory

[51] According to Law 1264/1982 there is a requirement of 21 employees in order to establish a trade union. The law does not define any alternative in such a case such as a trade union representative in such small companies.

framework setting minimum wage and working conditions. EGSEE is the most powerful prevailing any other collective agreement with less favourable conditions of employments to workers (EIRO, 2009). The minimum wage does not differ for varying categories of workers but the level of education, years of employment and family status are criteria used for the determination of total wages[52] (ibid).

Increasing competition and the gloomy economic climate has intensified efforts towards a more decentralised system of industrial relations in Europe, which involves more collective bargaining at enterprise level. This form of collective bargaining is more tailored to the needs of companies and individuals allowing for more flexibility in employment conditions and salary terms[53] (Zambarloukou, 2010; EIRO, 2009). Due to the current economic crisis, an increasing number of enterprise and personal level agreements have been observed as a result of the high uncertainty and high unemployment in the Greek labour market (Agelioforos, 2012).

3.3 European Research and Greece

In order to understand better the Greek context in terms of research, it is imperative to locate the position of Greece within the wider European context and compare the national indicators with the EU averages. As discussed in

[52] In these collective agreements at sectoral and enterprise level, there is a financial premium provided to employees according to what qualifications they hold. Thus, having acquired a master degree or a doctorate qualifies the employee to obtain a higher salary through a 'studies' benefit'. This financial benefit is calculated as a factor percentage of the main salary which is different between a master degree holder and a PhD holder (see chapter nine for more information).

[53] An example of this in the telecommunications sector, there are two systems of collective bargaining co-existing, one based on individual contracts and one on enterprise collective bargaining (Zambarloukou, 2010).

chapter two, the EU members agreed to devote 3% of GDP to R&D and acknowledged the need for increasing involvement of the private sector in terms of funding 2/3 of the R&D expenditure (EC, 2002). Considering the national research indicators , Greece had set its own national targets to 1.5% of GDP for R&D activities out of which 40% of the funding would come from the business sector until 2010 (GSRT, 2003). Although the national target might seem low, Greece was not able to meet it, not least due to the poor performance in R&D expenditure among its EU counterparts. Greece was characterised by the lowest rate of R&D expenditure compared to the EU countries in 1991 with only 0.36% of GDP devoted to R&D activities. In 1999, it reached 0.6% in 1999 (see Table 3.5) and presented one of the highest average growth rates of R&D intensity (8.71% (Eurostat, 2002) – following the GDP growth rate – during 1995-1999. In 2001, the Gross Domestic Expenditure on RTD (GERD) slowly lost its momentum reaching 0.57% of GDP in 2007, while the EU average was 1.85% (see Table 3.5). This evidence along with the deep depression that hit Greece in 2009, led to revision of the Greek targets with the expectation to be fulfilled by 2015 instead according to the strategic plan of Greece (NSRF 2007-2013) by the General Secretariat for Research and Technology (GSRT,2007,p.30).

Table 3.4 Investment in research (R&D)

Gross domestic expenditure on R&D			
	1998	**2003**	**2007**
EU-27	1.79	1.86	1.85
UK	1.76	1.75	1.79
Greece	-	0.57	0.57

Source: Eurostat 2010. Europe in Figures

The main funding body for R&D activity is the government (47%), followed by the business enterprise sector (31%) and foreign funding (mainly the EC with 21%). However, the performance of the business sector in R&D is limited.

Table 3.5 Gross domestic expenditure on R&D (GERD) by source of funds

Gross domestic expenditure on R&D by source of funds (% of total GERD)						
	Business enterprise		**Government**		**Abroad**	
% share of GDP	2002	2007	2002	2007	2002	2007
EU-27	54.6	55.4[54]	34.3	33.5[1]	8.9	8.6[1]
Greece	33.0[2]	31.1[1]	46.6[2]	46.8[1]	18.4[2]	19.0[1]
UK	43.5	47.2	28.9	29.3	21.5	17.7

Source: Eurostat, online
[1] Reference year: 2005, [2]Reference year: 2001

Universities and public research institutes absorb most of the public funding for research (approximately 70% of the gross domestic expenditure on R&D) through three modes: i) institutional funding (55.4% of Government Budget Appropriations or Outlays on R&D (GBAORD)) comprised of mainly salaries

and running costs (provided by the Ministry of Education and the GSRT through the annual budget funding); ii) thematic funding (23% of GBAORD) which is destined for undertaking R&D activities focused on specific thematic areas[55]; iii) non-targeted project based funding (approximately 17% if GBAORD), which is devoted for conducting basic research or towards infrastructure development.

Greece is one of the highest beneficiaries of funds from abroad reaching 21.6% of GERD in 2003 and 19% in 2005 (Eurostat, online). Of course this concerns European community funding via the community support frameworks and Structural Funds[56]. In terms of the framework programmes' funding, Greek research has been largely benefited by FP6 (419 million Euros for 2002-2006) and FP7 (121 million Euros[57], 2007-2013). More than half of this research funding concentrated mainly in the following priority areas which fall within the natural sciences and engineering: information and communication technologies; nanotechnologies and nanosciences; aeronautics and space; life sciences, genomics and biotechnology for health (Maroulis, 2009, p.4-5[58]).

[55] During the period 2007-2013, there are expectations for increasing of this share taking some money from the non-targeted project based funding.
[56] See for more: , last accessed 03/08/2008).
[57] This amount refers to the funding that has was secured by Greek research institutions by October 2008.
[58] Country reports have been produced from the DG Research and Innovation of the European Commission to demonstrate how different European countries have benefited from the FP6 and FP7 programmes. For the Greek report, see: , last accessed 08/04/2012.

Table 3.6 Research and development expenditure, by sectors of performance (% of GDP)

Research and development expenditure, by sectors of performance(% of GDP)						
	Business enterprise sector		Government sector		Higher education sector	
	2002	2007	2002	2007	2002	2007
EU-27	1.20	1.18	0.24	0.24	0.41	0.40
Greece	0.18	0.15	-	0.12	-	0.29
UK	1.16	1.15	0.16	0.17	0.43	0.44

Source: Eurostat, 2010
[1] Reference year: 2005, [2]Reference year: 2001.

Business Enterprise Research and Development Expenditure (BERD) has been quite low (15-18% of GDP) during 1999-2007 without significant change (Eurostat, online[59]). While computer and electronic equipment services are the main contributors to the BERD expenditure, Greece is highly specialised in rather low technology intensive sectors such as community services, food, IT services, trade and ship building in comparison to the EU-15 (Maroulis; 2009)[60]. Since the focus of R&D investment has been transferred to the private sector at European level, Greece needs to concentrate its efforts in boosting the business enterprise sector which is lacking[61] not just in terms of linking entrepreneurship and innovation, but also in attracting foreign investment. The low structural indicators and the small share of the private sector in research investment can partly explain the poor research performance of the Greek economy.

[59] These statistics were exported from the following site of Eurostat:
[60] The specialisation index reflects the proportion of the sector in the BERD of the country in comparison to the proportion of the sector in the total BERD of EU15.
[61] Apart from structural deficiencies of the private sectors, lack of skills and appropriate training of workforce might explain this phenomenon.

The business enterprise sector has been often identified as a weakness of the Greek innovation system since Greek firms are criticised for merely using rather than producing innovation (Technology Foresight, 2003). It has been reported that the Greek private sector adopted and transferred research from abroad and did not contribute to economic growth through developing research and development (R&D) activities domestically (Giannitsis and Mavri, 1993; EC, 2008). According to a latest EC report (2011, p.2), innovation in Greece

> "*flourishes thanks to organizational and marketing innovations and less on the production and exploitation of new knowledge".*

The availability of limited funds for R&D and innovation activities from venture-capital funds in Greece and the rudimentary cooperation of industry with universities and research institutes have prevented the Greek business sector acquiring an important role in R&D activities (ibid). Furthermore, if Greek companies are not interested in innovation and R&D, they would probably not seek and absorb highly skilled personnel such as PhD graduates and researchers. As reported in an OECD report (2008, p.122):

> *"The key policy challenges for Greece revolve around boosting innovation capability in the business sector and improving the absorptive capacity of firms, enhancing and better utilising scientific personnel, and continuing to build international linkages for knowledge transfer."*

Table 3.6 presents the R&D profile of Greece in main research descriptors in comparison to the EU average. While Greece appears to be lagging behind compared to EU in terms of human resources in research (new doctoral graduates and researchers), it has presented a higher growth rate than the EU average of these groups during 2000-2008 (EC, 2011, p.2).

Table 3.7 R&D profile of Greece, 2009

	Greece	EU
R&D intensity (GERD as % of GDP)	0.58	2.01
Business enterprise expenditure on R&D (BERD) as % of GDP	0.16	1.25
Public expenditure on R&D as % of GDP	0.42	0.74
New doctoral graduates(ISCED 6) per thousand population aged 25-34	0.8	1.6
Researchers (FTE) per thousand labour force	4.2	6.3
Scientific publications within the 10% most cited publications worldwide as % of total Scientific publications of the country	11.0	11.6
PCT patent applications per billion GDP (PPS€)	0.44	4.00
Employment in knowledge intensive activities as % of total employment	31.6	35.1

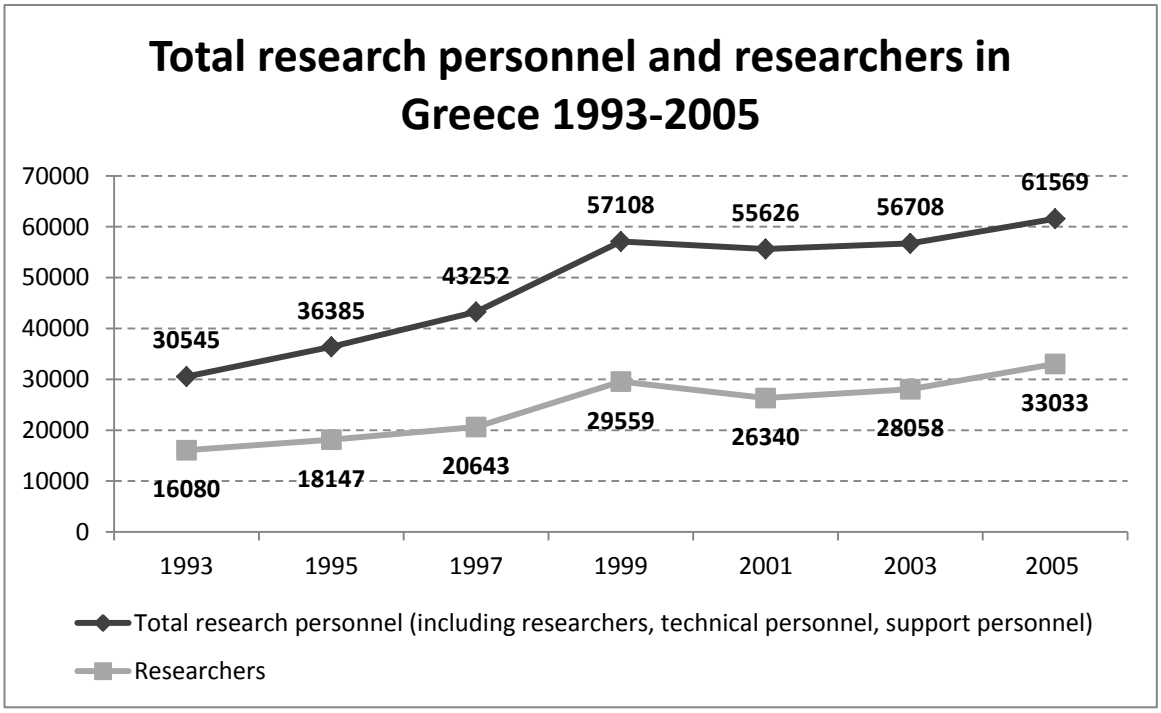
Source: DG Research and Innovation cited in EC (2011) Innovation Union Competitiveness Report, p.2 (adjusted), Data: Eurostat, OECD, Science Metrix / Scopus (Elsevier)

Policy reports have underlined the significance of highly skilled workforce in Greece for research development and innovation in the country (GSRT, 2003; Ministry of Economy and Finance, 2005; EC, 2006; Bartzokas, 2007). Highly-skilled workforce becomes a crucial factor towards the enhancement of foreign direct investment. The availability of highly qualified human resources, for example a pool of specialised researchers in new fields and sectors have been identified as a determinant parameter fostering innovation in technology intensive fields for 'location decisions' of multinational companies establishing their R&D units (Kuemmerle, 1999; Porter and Stern, 2001).

While it has been estimated that approximately 700.00 additional researchers would be required at the EU level for the fulfilment of the R&D objectives, at

Greek level, it has been projected that an increase of 39,000 (FT/PT) researchers is necessary within 2000-2010 (out of 70,000 research personnel needed) for meeting the Greek R&D target (GSRT, 2003). Statistical evidence shows that researchers and total personnel[62] in all sectors have doubled during 1993-2005, reaching 61.569 in 2005 approaching the Greek target63. However, in 2004, the number of Greek researchers per 1,000 employees was 3.3 with an EU average of 5.7.

Figure 3-1 Number of researchers and total research personnel in Greece. 1993-2005



Source: GSRT

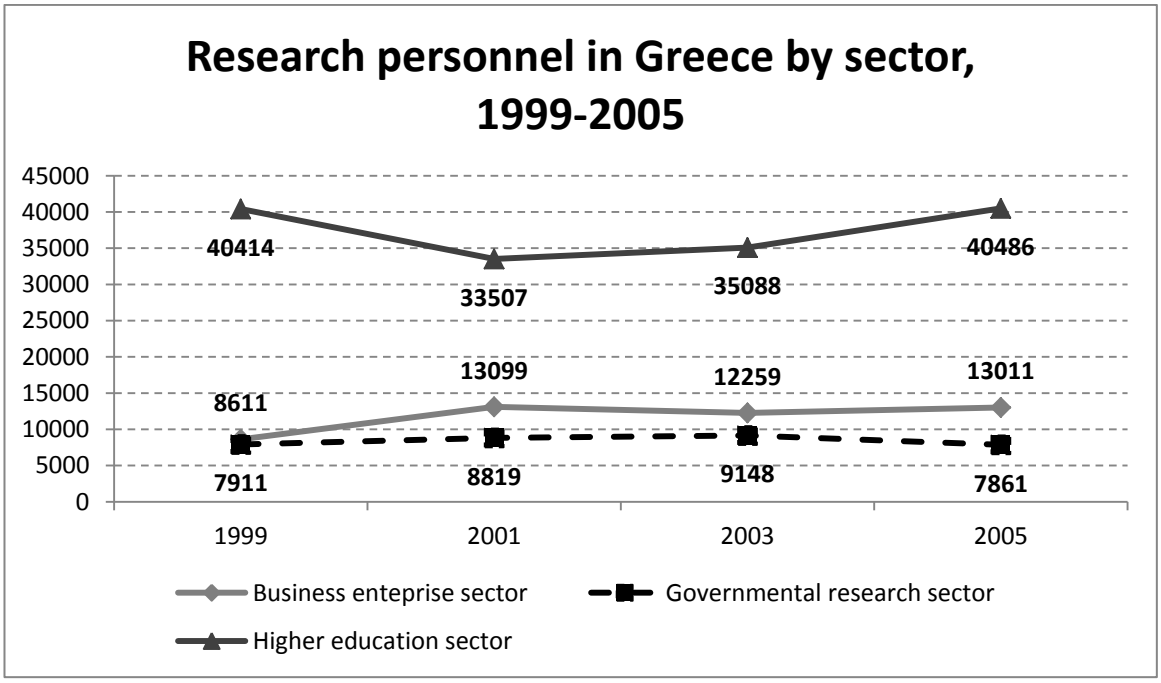
Researchers mainly concentrate in HEIs (23.984 out of 33.033 in 2005) while the business enterprise sector follows with only 5.994 researchers. However,

[62] The total number includes researchers, technical and administrative personnel but the emphasis is on researchers since PhD graduates will most probably be employed in those posts.

[63] By including the part-time researchers and research personnel, the figures move closer to the target set with 33.033 researchers and 61.569 research personnel

this sector seems promising since it had the biggest increase of researchers within the period, and had almost been quadrupled.

Figure 3-2 Researchers in Greece by employment sector, 1999-2005.



Source: GSRT

While research personnel figures express the input resources to R&D activities, the production of new researchers lays especially in the doctorates awarded, constituting an output from scientific and research establishments. Therefore, importance is attributed to the growing proportion of Greek students obtaining a doctorate. Although there is evidence on R&D personnel on qualification level in Greece (see the graph below), there is no information[64] on the destination paths of Greek doctoral holders, with home and foreign doctoral degrees and their role within the national research system. Before looking at the current situation of higher education system, doctoral education

[64] Greek LFS provides figures for share in the public sector, self-employed but it does not capture research/academic/administrative posts within the public sector and also it does not distinguish doctoral holders from foreign universities.

and labour market, the following sections outline briefly the bodies responsible for research governance and policy in Greece.

3.3.1 Research policy

Greece, since 1964 has undertaken a series of initiatives to organise research and technology activities at national level. It was not until the 1982 – after Greece joined the EU in 1981 – with the bill of 1266/82 that an independent Ministry for Research and Technology was established, reflecting thus the importance of research and technology attributed by the then political leadership.

Three years after, a new legal framework (1558/85) stipulated the merger of the Ministry of Research and Technology with the Ministry of Industrial Energy and National Resources[65] under the form of the General Secretariat for Research and Technology (GSRT). This merger facilitated the launch of successful programmes aimed in the development of industrial research and towards supporting research personnel. In addition, this legal act introduced an institutional framework which allowed the coordination and supervision of research institutes by the Ministry and the GSRT. In this law, the importance of researchers was recognised and their position was enhanced by rendering them equal to the academic personnel of HEIs. Therefore, this law triggered further participation of scientists in research activities and also contributed to the repatriation of scientists living abroad.

[65] The new Ministry was called Ministry of Industry, Energy and Technology which operated during 1985-1996. In 1996, this Ministry and the GSRT was incorporated in the Ministry of Development.

Since 2001, the GSRT along with the National Research and Technology Council (ESET) (2919/2001 law) was responsible for the planning and implementation of scientific and technological policy of the country.[66] In March 2008, the Greek parliament approved a new framework for governance of research and innovation including the establishment of new bodies such as: an inter-ministerial committee ensuring the coordination of research and technological innovation activities of the different ministries; a national council that held responsibility for formulating main policy; and a national agency that was in charge of the management of research activities (law 3653/2008). Despite the approval of the law by the Parliament, the law was put into effect in January 2010 instead of January 2009. The criticism of this framework by the opposite political parties coupled with the elections and the change of the government during 2009 partly explain the postponement of this law. The new government decided to alter the Greek research governance and policy since for the first time, the GSRT shared responsibility for the research policy with the Ministry of Education. The GSRT was incorporated within this Ministry retaining its responsibilities according to the Presidential decree 189/2009 (Erawatch, 2009).

Although Greek research policy and its governance has been quite young, it has passed through turbulent times with many mergers, various legal

[66] Within the third Community support programme the following objectives were identified by GSRT:
Enrichment of the production chain with new activities of knowledge intensity
Creation of new ventures from researchers and research institutions
Support of new ventures in science parks with consultancy services and capita
Attraction of foreign companies in the use of Greek research and technological infrastructure
Support of R&T activities for competitiveness

frameworks and changes due to the successive governmental changes which continues until nowadays. The Greek research policy and innovation has been criticised for its discontinuity, the lack of a long term coherent policy with specific priorities, the fragmentation and limited coordination between the different actors in the national R&D system (EC, 2006; Bartzokas, 2007). These characteristics might explain to some degree the poor research and innovation performance of the country.

A plethora of policy documents regarding innovation and research policy in Greece have explored further the weaknesses of the research and innovation system but also the opportunities for its enhancement (GSRT, 2007;2003; Ministry of Economy and Finance, 2005; Bartzokas, 2007; Maroulis, 2009).

Komninos and Tsamis (2008) concluded that there are four asymmetries in the Greek system regarding innovation: the dominant role of public sector in R&D activities compared to the business sector, the high propensity in adopting rather than creating innovation, the limited number of small innovative sectors in relation to the rest of the Greek economy and the high geographical concentration of innovation activities. These weaknesses are further deteriorated by the discontinuity of Greek research and innovation policy and the absence of a stable public funding stream for research and innovation activities. Furthermore, Bartzokas (2007) in his distinction ‘supply-driven’ and ‘market driven’ R&D systems, highlighted that the main challenge for the Greek system is that it is a ‘supply driven system’. Thus the difference of the Greek R&D system compared to market-driven system is specified by the fact that

> *"the availability of funds drives the expansion of the system['supply-driven']. In market-driven R&D systems, a mature and thick market for ideas is being activated. The process of market creation develops its own set of incentives and rules of selection. On the contrary, in supply-driven systems, institutional inefficiency is not a problem, when a continuous flow of resources takes place" (ibid, p.9-10).*

The availability of funding –especially EU funding – defines to some extent the agenda of Greek research. While the number of highly skilled is increasing in Greece due to the great share of EU programmes devoted to training of postgraduates and researchers, the limited demand for research activities might have negative implications for the career prospects of young scientists (Bartzokas, 2007, p.32). For example, these EU programmes support the training and development of PhD graduates and researchers but it is doubted whether the current R&D system can absorb them.

At the same time, the fragmentation of research in Greece and specifically in the higher education sector is another weakness of the system. This research disintegration derives from the bottom up approach of the educational system according to which research priorities are defined on the basis of individual professors' interests or funding availability by national or EU programmes (EC, 2006, p.8).

Initiatives and national programmes (such as the National Reform Programme (for 2005-2008 period), the National Strategic Reference Programme (2007-2013), the Technology Foresights exercises[67], have highlighted the importance

67 This initiative launched in 2002 under the aegis of GSRT, was funded by the Third European Community Framework and it was undertaken by a pool of 3 partners: Athens University of Economics and Business, National Technical University of Athens, Higher School of Public Health, LOGOTECH A.E for more see: , 03/08/08

of research human potential as a strength for the Greek economy towards the transition of Knowledge based economy (see Table 3.9). However, there is a national concern about the top level scientists pursuing careers abroad leading into the threat of 'brain drain' which would be discussed below. Therefore the NSRF opts – as part of its overall effort to fulfil the Lisbon objectives – to improve the human capital through appropriate reforms in education and training that would enhance the employability of the graduates, but also upgrade their skills and training required into the knowledge based economy. Postgraduate studies, research training and networking activities (where all stakeholders are engaged universities, research centres and industry) are emphasised as a means for further production and development of human resources in research, technology and innovation activities (Ministry of Economy and Finance, 2005). As highlighted in a GSRT report on R&D

> *"by paying appropriate attention to the development of its research workforce, Greece not only lays the foundation for a healthy tomorrow, but also defines the course for economic activities" (GSRT, 2004, p.16).*

In addition, a consultative document by GSRT (2003, p.39) refer to human potential as the

> *"most critical factor for the success of every research and technological policy. Research industry is dependent mainly on the quantitative and qualitative efficiency of researchers and the rest of technical and administrative personnel."*

However, it is acknowledged that this factor should not be seen in isolation. It is imperative to be complemented by an educational system that will foster the development of skills and create of a pool of high level human potential (GSRT -Technology foresight, 2004). The critical role of education is highlighted in

nurturing a highly skilled workforce that will contribute to knowledge production, research and innovation (Ministry of Economy and Finance, 2005).

Table 3.9 shows some of the issues mentioned in the SWOT analysis in the NSRF, emphasising points related to human resources and research.

Table 3.8 SWOT analysis – NSRF Greece 2007-2013

STRENGTHS	**WEAKNESSES**
Considerable pool of highly skilled workforce High level human potential in research with international presence and networking with the research community of Diaspora	Lack of educational infrastructure Low participation in LLL programmes
OPPORTUNITIES	**THREATS**
Existence of significant scientific pool of Greek Diaspora	Increase of the brain drain of high level scientific potential abroad

The importance of education policy is highlighted in NSRF, which includes the operational programme 'education and lifelong learning' aiming at enhancing the participation of the Greek population in lifelong learning and reinforce human capital in knowledge production, research and innovation (Ministry of Economy and Finance, 2005).

It is evident that education and furthermore higher education policy and its outcomes in terms of highly skilled workforce production are tightly woven with R&D activities and could critically influence its future. It would be interesting to see how higher education policy has changed or not especially regarding postgraduate education that is closer to research agenda.

3.4 Higher education policy and system

In order to understand the mentality and culture of Greek academia, it is crucial to consult the legislative acts of higher education in Greece. However, it is not the intention to provide a historical overview of university education which is well provided by Bouzakis (2008). The first legal document regarding higher education was disclosed in 1836/7 after the establishment of the Othonian university[68] – now called national Kapodistrian university of Athens – regarding 'structure of university'. This was based on the German model and set as primary goal the general education of students (Xoxellis, 1989). According to this decree, the university was not to be an autonomous institution in terms of governance but under the supervision and monitoring of Ministry of education and religious affairs. The German model entailed among other consequences, a dysfunctional framework, characterised by limited transparency in university management, the concentration of power at professorial level[69] and to limited access with state intervention not tailored to the needs of Greek society [70](Bouzakis, 2008; Antoniou, 2006). The German influence has persisted in the Greek higher education system not only by remaining a cumbersome system but also in terms of '*offering an ideological framework for the over-burdening of students and for the extreme scholasticism of the courses taught'* (Gavroglu,

[68] Othon was the king of Greece during that period.

[69] As further explained below, the 'chair' system reflected high decision making power in a few academics who had the absolute control on academic and management issues of the departments including future appointments of academic staff.

[70] Both Bouzakis and Antoniou refer to the adoption of German standards and characteristics in the establishment of Greek university such as 'scholasticism, classicism and ethnocentrism' (Bouzakis, 2006). Thus the university has been criticised for not meeting social and economic needs such as acquiring a more developmental and professional orientation by introducing university departments related to agricultural, industrial and commercial activity (ibid).

1981, p.103[71]). For about a century, there were no substantial developments in legislation since educational policy was dependent on ministers of education (Dimaras, 1974) and the continuous governmental and ministerial change prevented a consistent and coherent Greek educational policy. Within a period of eight years (1920-1928), 33 governments and 25 ministers of education changed (Fragoudaki, 1977).

In 1932, an educational reform was undertaken with the 4353/1932 law. While this framework provided a bureaucratic and rational management system, it established the institution 'chair' for about half a century. The so called 'chair' allowed professors who occupied a chair, to have a monopoly on decision-making about appointments (Papadakis, 2004) at the expense of a meritocratic system, for the selection of academic staff. Gavroglu (1981, p.106) described the rights that this system provided:

> *"With the chair system, the professor who holds a particular chair legally has the right to decide what to teach, how he will teach it, what he will examine, what textbook to suggest, what books will be ordered for the library, and who will be appointed to and who will be fired from the other positions."*

While the new law empowered the university bodies, the Ministry's supervisory role had persisted. Many efforts were undertaken – especially at ministerial level – to change this law but due to resistance from the beneficiaries of the 'chair', it was not until 1982 that the law 1268[72] was introduced, a landmark for the modernisation of higher education that abolished the chair and widened

[71] Gavroglu (1981) used the example of engineering and the course of thermodynamics to demonstrate how the Greek curriculum has been greatly influenced by the German model since the foundations of Greek universities.

[72] This law introduced graduate studies that resembled the North American system rather than the central European systems that were followed until then. Before this law a very small number of doctorates have been conferred while this law set the foundations for more meaningful postgraduate programmes (Karmas et al, 1988).

access to academic staff. According to Tsaousis (2001), this law facilitated the transition from the Humboldtian (German-influenced) system and the chair, to the American academic hierarchical system. This law introduced the organisation of the university into schools/departments/sectors (‘tomeis’) and widened the decision making bodies of the university including the participation of students and staff in university management, facilitating the development of the higher education system, as was envisaged. In addition, this legal framework was perceived revolutionary in terms of widening access to academic staff coming from non-elite socioeconomic class in a highly elitist academia until its introduction. This law established the autonomy of the Greek university, aiming at a more meritocratic and more transparent education system.

However, it has been heavily criticised within the last decades for its lack of appropriateness to the current conditions and its consequences in terms of selection of academic and administrative staff (Saiti, 2010). According to this law, existing personnel of HEIs were able to be upgraded to occupy academic posts. More specifically, it provided the opportunity to ‘assistants’ and scientific associates with a PhD to occupy *de jure* academic positions. If members of staff didn’t have a PhD, they were given the opportunity to complete a PhD within four years and be immediately appointed to a *de jure* academic post on achievement of this qualification. If they did not complete a PhD within a specific period, then they could be transferred to a public sector post. While this law aimed at ensuring meritocracy, the professors who enjoyed the power of the chair system still managed to maintain their influence, but via another

route. Anecdotal evidence suggests that professors supported assistants and scientific associates – which were already in their sphere of influence – to become academic personnel of the university although the latter did not have the appropriate qualifications. In this way, they secured in return the support – namely their votes – of this new academic staff in the decision making procedures of the university. The ability of the professors to 'manipulate' the new legal system for their personal interests rather than consider the benefits for the institution was illustrated below by an established academic professor:

> *"The 'chair', the 'little kingdom' [system of] the chairs were abolished with the law 1268/1982. But since decisions were made through a voting system, professors with chairs were making sure that they would still have a lot of people around them that would support them in decisions, that were undertaken within the department. So what did a professor do? Instead of looking for good associates, whatever assistants he had – bad or good – he was making them lecturers, senior lecturers, who would have the right to vote. Although this was not applied to all, a great proportion of academics did this which has plagued the Greek universities. However, these people will soon retire and younger people are much better nowadays, so the universities will become better in the future."*

[Male, Professor in urban university, Natural Sciences]

The law 1268/1982 also defined the main academic ranks and the regulations related to them and most importantly, principles for the procurement, the recruitment procedure, the 'election' procedure and the appointment. Considering that numerous committees and formal subgroups[73] are involved in these procedures (and sometimes procedural and decision documents have to go back and forth, to be approved for their legitimacy), it is unsurprising that progress towards full implementation of the procedure lasts for many months, even years.

[73]These include: the general assembly of the university and the general assembly of departments, the rector's council, committee of electors and recommendatory committee, the Ministry of education.

Accompanying the continuous change of Ministers of education, many legal frameworks have been introduced but not always implemented. While some laws[74] have touched upon the issues of recruitment and selection of academic staff, they have not introduced substantial changes until today, other than regulating different number and structure of the electoral committees for the candidates often confusing and delaying the process.

Since the 1980s, more HEIs were established in Greece with the higher education sector expanding and the numbers of students significantly rising (Gouvias[75], 1998; Kanellopoulos, 1996). In 1992, a new law 2083/1992 stipulated the organisation of postgraduate studies and boosted the postgraduate population in Greece. In 2008 (law 3685/2008), autonomy of HEIs was enhanced in terms of organising and designing postgraduate degrees including doctoral degrees. This law also recognises doctoral student as both students and early stage researchers who are benefited in different ways according to their status. As students, they are eligible for free healthcare, reduced transportation costs and reduced tickets for cinemas, theatres and they can take student loans while as researchers they are eligible for scholarships by various bodies, such as GSRT, IKY, EU-funded programmes. In addition, this law enhances opportunities for creation of

[74] Most of the modifications in the procedures for the recruitment and appointment of DEP which have been introduced by the laws in 1992, 2007, 2008 and 2010 concern the number of the electors' committee, the extension of time periods required for different stages of the procedures and responsibilities regarding the publication and notification of the procurement .
[75] Gouvias refers to the expansion of higher education institutions and departments in Greece as a result of 'political opportunism' catering political interests rather than being connected to long term well thought policies.

research university centres where PhD candidates can undertake their studies and possibly work as researchers (Bologna report, 2009).

Educational reforms have been introduced in higher education aiming to facilitate the comparability of higher education degrees due to the increasing endorsement of the Bologna process by European countries[76]. While the Bologna process started quite moderately in 1999 with a few moderate action lines in the higher education sector, initiatives (such as the European Research Area and the European Higher Education Area) were undertaken to link the higher education with research. As outlined in chapter two, the increasing European emphasis on PhD graduates had led to a number of doctoral reforms in different European countries in order to improve their doctoral programmes. However, Greece has not been affected by these developments as proved by the lack of educational reforms concerning doctoral education. Doctoral education has remained the same except from the increasing number of PhD graduates and candidates. This raises issues for this new situation regarding appropriateness of doctoral programmes, deployment of this workforce, which have not been explored in the Greek literature.

3.4.1 The higher education system in Greece

Higher education is considered one of the main missions of the state and all Greeks have the right to free education at all levels as article 16 of the Greek constitution stipulates. The higher education sector in Greece is comprised of

[76] For example, the law 3374/2005 was introduced for the establishment of transfer and accumulation credit systems and the Diploma Supplement.

two sectors: the university sector and the technological sector. The Universities, the Technical universities (or the so called Polytechnics[77]) and the School of Fine Arts falls within the university sector, while the Technological Education Institutions (TEIs) [78] along with the School of Pedagogical and Technological education falls within the technology sector [79] (Law 3549/2007 in Bologna Report, 2009). It was not until the 1983 that technological educational institutions were established in Greece (1404/1983) while in 2001 they are incorporated in the higher education sector along with the universities (2916/2001). There are also private colleges, working as franchising organisations cooperation with mainly UK and American universities. The colleges have been registered as commercial enterprises while recently their responsibility has been fallen under the Ministry of Education and Culture which has provided to some of them a license to be considered as post-secondary education institutions.

Education is one of the main governmental priorities where a big part of the state budget is often devoted. The rhetoric of the Greek policy makers on the importance of education, (Deniozos, 2010; Georgiadis, 2007) do not seem to coincide with the statistical evidence provided. Eurostat figures (EC.2010) show that Greece has raised its spending in 2005 to 4% (EU-27 average was

[77] It should be mentioned that Polytechnics in Greece are very prestigious institutions providing courses in engineering and technology fields and they do not carry the negative connotation of lower status higher education institutions as it might be the case in other countries.
[78] TEIs offer 3-4 year degrees which are characterised by a more applied character than the university degrees. Universities and TEIs are considered as institutions providing Tertiary type A, ISCED 5A. Only universities are eligible in conferring masters and doctoral degrees while TEIs can only provide Masters degrees through cooperation with universities.
[79] TEIs are considered low status institutions since they have recently been allowed to confer postgraduate degrees in cooperation with the university sector for the time being. After the completion of evaluation procedures by the Hellenic Quality Assurance Agency, they would have the right to award postgraduate degrees on their own.

5.05%) of GDP on educational institutions since 2001 while private expenditure remains quite low (0.25% in 2005 while the EU-27 was 0.67%). In addition, the expenditure on public and private educational institutions per pupil/student remained quite low in 2006 at 4,485 PPS while the EU-27 reaches 6,003 PPS.

Weaknesses of the Greek higher education system

Recent policy reports (Eliamep, 2006; ADIP, 2009) have highlighted some of the main weaknesses of the Greek higher education system, which date back to its origins and development, and might explain why Greek students go for studies abroad. Eliamep (2006) highlights the introvert character and the subsequent lack of transparency, the inefficient internal control and the limited social accountability that characterise the Greek higher education system. Some of the criticisms concern not only the lack of organisational and building infrastructure of HEIs, but also the lack of administrative, technical staff and permanent teaching staff (ADIP, 2009). An important point made in this report about the Greek higher education system was:

> *"the inability [of the system] to attract excellent postgraduate students and postdoctoral researchers who go abroad due to the lack of incentives and scholarships" (ibid, p.21).*

Access to higher education

Access to higher education is undertaken through the matriculation exams (Panhellenic national exams). The responsibility for the exams lies within the Ministry of Education. The national exams system has changed in the last ten years respectively to the changes in the government and the ministry of education. Admission is regulated by the Ministry according to numerous

clausus policy that defines a specific number of persons for each university department. Gouvias (1998) has argued that this system contributes to enhancing inequality of access to the Greek students.

The Greek higher education system is organised in three cycles[80] compatible with the Bologna process: the first cycle (undergraduate education); the second, (Masters' programmes); and the third (doctoral education).

Enrolment

Higher education has always been in high demand (Saiti and Prokopiadou, 2008; Nassiakou, 1981; Tsoukalas, 1981; Psacharopoulos and Soumelis, 1979), which can be seen by the high participation of Greek students in HEIs. In 1997, only 16% of 25-64 year olds completed tertiary education

According to the latest figures of OECD (2010), Greece has a high enrolment rate in education[81] (82.7% in 2008, see Table 3.10) which is higher than the OECD average (81.5%). Within the last 15 years, more and more Greek youngsters of 15-19 year olds are enrolling upper secondary education and tertiary education (see table below).

Table 3.9 Trends in enrollment rates of young people in upper secondary education

	1995	2000	2003	2008
Greece	**62**	**82**	**83**	**83**
OECD average	**74**	**77**	**79**	**82**

[80] Until 1982, the system was organised in two cycles: undergraduate and postgraduate where the latter concerned primarily doctoral education.
[81] 15-19 year old enrol upper secondary and tertiary education

Source: Education at a Glance 2010: OECD Indicators

In terms of disciplinary preferences, Greek students similarly to other European students prefer social science subjects, business and law to study in tertiary education. Engineering, manufacturing and construction subjects also seem to be quite popular in Greece in comparison to the EU-27 and the UK, which might be owed to the prestige of the Technical schools in Greece and the increasing power of the Technical chamber of Greece[82] regarding access to the labour market. Looking closely to Eurostat figures by gender, more male graduates were in science, mathematics and computing fields while three to one in engineering and related fields (Eurostat, 2010, p.264).

Table 3.10 Disciplinary preferences of tertiary education students in Greece, UK and EU.

%	Humanities & arts	Social sciences, business & law	Science, maths & computing	Engineering, manufacturing and construction	Agriculture & veterinary	Health &welfare	Services
EU-27	13.1	33.9	10.5	14	1.9	12.6	4.1
Greece	13.5	31.8	13.6	17	5.8	9.6	3.1
UK	17.1	26.9	13.4	8.4	0.9	16	3.1

Source: Eurostat, 2010

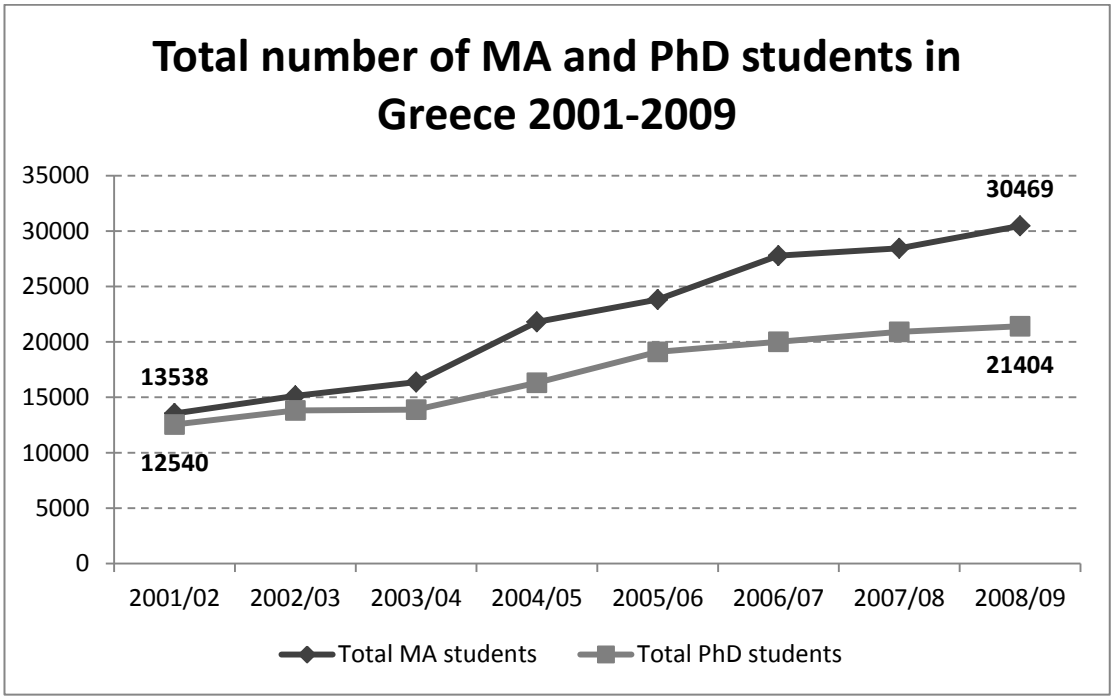
Postgraduate education

The legal framework 2083/1992 enhanced the autonomy of departments in organising postgraduate programmes, which led to an exponential increase of Master's programmes, Master's graduates and subsequently doctoral

[82] The Technical Chamber of Greece (TEE) is the professional association for engineers and architects. It is a prestigious and very powerful body in negotiating and ensuring access of its members to various occupational sectors. Graduates in engineering and architecture need to undertake exams in TEE and acquire a special license in order to 'exercise' their profession and access relevant occupational areas.

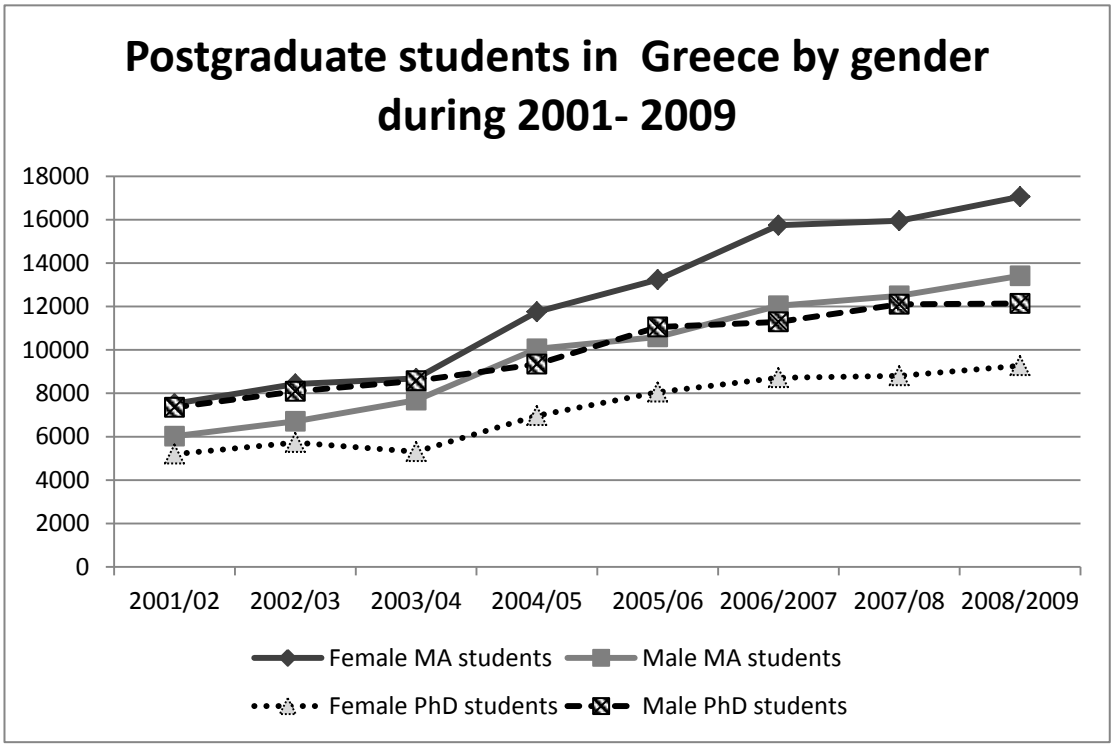
candidates and graduates. Indicators show that while there were 50.057 postgraduate students in 2001-2002, only six years later, this number reached 77,167 out of which 37,712 were PhD students (Kathimerini, 2009). In Greece, during the last decade (2001-2010) the number of students enrolled in Master and PhD programmes has almost doubled (ELSTAT, online, see Figure 3.3). The data provide an interesting picture in terms of gender distribution between Master's and PhD students. Similar numbers of male students are observed in Masters and PhD programmes but the number of female Master's students has increased exponentially overcoming continuously male Masters' students since 2004/2005. On the contrary, fewer women are enrolled in doctoral programmes reflecting potentially the unattractiveness of a long term degree (more than three years) in a period where life-cycle events might be more important for women (Karamessini, 2004, p.21).

Figure 3-3 Trends in postgraduate education enrollment in Greece, 2001-2009.



It could be argued that the Universities were quite motivated in designing and creating more and more postgraduate programmes due to both collective and individual returns. After all, universities are able to charge fees for their postgraduate programmes, while academics could use postgraduate programmes for their establishment and promotion.

Figure 3-4 Trends in postgraduate education enrollment in Greece by gender, 2001-2009.



From the individual perspective of Greek students, investment in higher education is considered as a means to reduce unemployment risk and enhance career prospects. For example, Mitrakos et al. (2010) showed that Masters' and PhD graduates enjoy high earnings in the Greek labour market based on LFS data. Postgraduate qualifications can thus be a competitive advantage in the Greek labour market. In addition, as mentioned before, the

Greek public has always considered education highly important as it is reflected in the high demand for higher education and the continuous financial parental support provided (Saiti and Prokopiadou, 2008).

3.4.2 Doctoral education in Greece and UK

It is essential to set the general context of Greek doctoral education and identify differences and similarities when compared to the UK doctoral education in order to understand the career paths and the experiences of Greek PhD graduates from doctoral education to employment. Naturally, this section does not aim in an extensive comparison of doctoral education in the two countries – there are obviously many differences within the PhD education within each country – but rather in providing an overview of doctoral education in Greece and the UK, its main principles and general characteristics.

Institutional autonomy

Both Greek (3685/2008) and UK Universities are free to design and organise postgraduate studies including doctoral programmes. However, they both need to

> *"engage in resource negotiations with the relevant Ministry or another national agency, to secure resources necessary to open potential new programmes" (EUA, 2009, p.34).*

Greek Universities can be characterised as autonomous in principle especially when they are compared to their EU counterparts such as the UK Universities. In a recent exploratory study on the autonomy of European universities in 34

countries (EUA, 2009[83]), it was found that Greek Universities are under quite a few restrictions such as the 'numerus clausus' (the state sets student quotas), and state control on financial and staffing issues.

In terms of financial autonomy, both university systems are mainly funded by their respective governments. However, Greek HEIs are quite limited. For example, they do not have the ability to decide on the allocation of the state budget between different activities since this is decided by the Ministry/Parliament. In contrast, UK HEIs receive a block grant type that enables them to decide on the distribution of the budget. At the same time, Greek HEIs do not have the ability to borrow money from the banks or sell real estate they own as their UK counterparts are free to do (EUA, 2009). Moreover, Greek HEIs cannot set fees at Bachelor level – apart from Master's level – while UK universities decide freely on the tuition fees at all degree levels considering maximum tuition set by the government.

Finally, UK universities are free to recruit staff, while in Greece the number of academic and administrative posts is regulated at national level. Staff members in Greek HEIs have civil servant status with salaries determined by the state whereas in the UK, staff is considered as employees of the university and not of the state.

[83] See for more: http://www.eua.be/fileadmin/user_upload/files/Publications/University_Autonomy_in_Europe.pdf

Admissions

According to legislation regarding doctoral education (Law 2083/92, article 12), students are evaluated for their enrolment onto a doctorate on the basis of: first degree performance (achievement, grade); marks on modules relevant to doctoral research; assessment of MA or first degree dissertation; and, previous research experience[84]. The knowledge of at least one foreign language is also required.

In the UK, entry requirements are the prior academic attainments, with a Master's, considered desirable as evidence of research ability, rather than a prerequisite (Park, 2005). Moreover, some universities may choose on additional criteria, such as performance in the interview, but the references will be the main criteria for admission (Salinger, 2007).

Funding

Funding has been among the most important problems that Greek PhD students face (Galanaki, 2002; ELEPETYD, 2005). While there are a limited number of scholarships provided to Greek students by scholarships' foundations, the amount is often very low, ranging between 200-600 Euros[85].

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[84] In the past decade, some universities have defined internal regulations of the institution that might specify additional requirements for doctoral education while there might be a few differences at departmental/school level. According to the new regulations of postgraduate studies (2011), references from academics or employers are also among the parameters considered for the evaluation and selection of postgraduate students. However, the department decides on the importance of additional criteria for the selection of candidates.

[85] The State Scholarships Foundation provides a small number of scholarships for Masters' and PhD degrees within foreign or Greek universities. Apart from covering tuition fees where is required, the stipend has been very low and requires additional financial support. According to Karamessini (2004, p.12), only a minority of postgraduate students receive a scholarship and reported that in February 2004 the State Scholarship Foundation provided scholarships to 704 students for pursuing Master's or doctoral programmes. The monthly allowance from this foundation was 450 Euros for a year for the Master's students and for up to three years for the

Although there are no fees for Greek PhD programmes, some departments may require PhD students to work between 5 to 15 hours per week (it varies according to department) conducting lectures, supervision, general assistance and office tasks for professors and academic services. Parental financial assistance is among the main sources of doctoral funding since the Greek public considers higher education very important. At the same time, PhD students may work in the University as mainly as teaching or research assistants.

Greece is a great beneficiary of European framework programmes that provide funding opportunities for PhD candidates through participation in EU projects granted to research groups/units in Greek universities and research institutes. It is expected that many PhD candidates in natural sciences and engineering in Greek institutions funded their education through these EU projects, considering the success of Greek institutions in securing funding from FP6 and FP7 programmes in those disciplinary areas. During the period (2002-2008), increased funding was available for doctoral studies through two European programmes that the Ministry of Education coordinated: the HERAKLITOS

PhD students. For the period 2007 -2014 the Foundation has been responsible to implement a European project – within the context of National Strategic Reference Framework (NSRF) 2007-2013 - on providing scholarships for postgraduate studies in Greece and abroad. As a matter of fact, it is reported in the website that for 2011-2012, due to austerity the Foundation would provide scholarships funded by NSRF. In addition it is mentioned: 'The State Scholarships Foundation will not provide any scholarships for doctoral studies or postdoctoral research in Greece taking into account that through NSRF a higher number of scholarships than the number of scholarships usually provided by the Foundation (849 scholarships have been given to PhD candidates for the programme Heraklitos and the programme of postdoctoral research in the General Secretariat for Research and Technology', (http://www.iky.gr/IKY/portal/gr/announcements/detailedAnn_GR_Window?action=2&annId=80, last accessed 15th August 2011).

(2002-2004) programme and the PYTHAGORAS programme (2004-2008). The HERAKLITOS[86] programme concerned scholarships to PhD students for completing their doctorate. Since 2001, the Ministry of Development has also used EU and national funds[87] to subsidise PhD students' participation in research projects undertaken by universities (Karamessini, 2004, p.13).

In 2008, HERAKLITOS II was launched with the aim to provide funding for another 800 PhD programmes[88] (plus 400 programmes in a subsequent phase) starting at 2010, but still the procedures have been delayed and the funding has not yet been released. The PYTHAGORAS programme includes funding opportunities mainly for PhD graduates to undertake postdoctoral research projects, supporting research groups in Greek universities. Thus, this programme was significant for the enhancement of career prospects for new scientists and the utilisation of their knowledge and skills.

Limited funding opportunities for doctoral research in Greece can lead PhD candidates to work during the studies with negative consequences for the focus and the quality of research.

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[86] HERAKLITOS was a programme included within the Operational Programme for Education and Initial Vocational Training in Greece funded under the Third Community Framework Programme (2000-2006). The Ministry of Education was responsible for the operation of HERAKLITOS since 2003 which aimed at funding PhD projects of basic research (75% funded by EU funds and 25% by national funds).

[87] These funds are drawn from the European Social Fund which contributes towards 75% of this programme while the Greek state provides the rest 25%. This funding is destined for the development of research and technological workforce under the Greek competitiveness programme.

[88] HERAKLITOS II is included under the Operational Programme Education and Lifelong Learning 2007-2013.According to this programme, each doctoral project will be allocated the amount of 50.000 euros out of which the PhD student is entitled to a monthly allowance of 900 Euros for three years.

In the UK, fees are charged to PhD students but there is a plethora of scholarships that PhD candidates could apply for. The most widely known are the awards from UK Research Councils (RCUK) which provide funding for both fees and a monthly stipend. Institutional scholarships are also available (mainly covering fees) apart from charity or industry scholarships. In terms of paid work, teaching and research activities can also be carried out as a source of income (Salinger, 2007). Previous research has showed that PhD candidates with RCUK funding or other scholarships were more likely to complete their PhD within four years compared to doctorate holders with different funding sources (Purcell et al., 2010). UK doctoral candidates funded by the Research councils have been under increasing pressure over the last decade to complete within the period of their studentship. Effectively all the Research councils are required to show their degree training investment has been well spent.

Organisation and structure of doctoral education - Supervision

A major difference between the two systems is the absence of any form of graduate school in Greece, that could provide subject specific or generic training to PhD candidates. Doctoral programmes in Greece include taught elements which are decided by the doctoral candidates and their supervisors on the basis of availability in the respective department. PhD studies in Greece are mainly organised around the apprenticeship model which derives from the

German ‘master apprentice model’ (Kehm, 2009) that continues to be dominant in Greece[89].

The Greek legal framework also defines that every PhD student has an Advisory Committee which is comprised of three academics, among which there is the primary supervisor. On annual basis, PhD candidates are monitored and evaluated by the committee leading to an annual progress report (Law 2083/1992, article 13). Once the thesis is complete, an oral exposition needs to take place in in front of an Assessment Committee. This is composed of the Advisory Committee and four additional academics. The Assessment Committee decides whether the thesis provides an original contribution to knowledge and the doctorate is granted if five out of seven academics give their consent. In a small survey of Greek PhD students by the Hellenic Association of Doctoral Researchers (ELEPETYD, 2005), 80% of the respondents indicated that the PhD topic was often selected by the supervisor and/or the candidate.

Critics of the Greek higher education system also allege that domicile educated PhD graduates are not urged to complete their PhD quickly because their supervisors benefit from their availability and willingness to provide ‘their free or cheap labour services’ in teaching/providing tutorials for their modules or participate in research projects. As an established Greek academic in the

[89] As mentioned before, the Greek higher education system was based on the German system affecting also doctoral education including the ‘master-apprentice’ model. In this model, the doctoral degree was individualised – did not include any additional training – and the supervisor was able to accept or reject the doctoral candidate with the proposed theme of research. (Kehm, 2009).

natural sciences department reported in an interview undertaken for the purposes of this study:

> *"Greek PhD graduates are quite knowledgeable; the problem that I see is that they take long to complete their PhD. In my opinion, they are 'parking' because their supervisors do not kick them out, because they exploit them in a good way […] If the PhD candidate is not overambitious and is not in a hurry to do something else, remains as a PhD researcher working on temporary work provided by the professor"*
>
> **[Greek academic, natural sciences department).**

Supervision issues such as frequency of meetings or training for supervisors has not been touched upon in the Greek doctoral context. In the UK and Europe, quality of doctoral supervision has emerged as a significant issue which requires further research (Park, 2005; EUA, 2007; UK Government White Paper, 1993). In the UK, PhD students can have one or two supervisors that provide guidance and meet regularly during their doctoral studies. The need for training of supervisors has thus become increasingly important (Pole et al., 1997; Park, 2007) and UK institutions are currently undertaking efforts organising training sessions for academic staff on how to supervise.

Age and duration of doctoral education

Greek and UK students enter higher education at similar age of about 18 years old. Considering the length of degrees as outlined in Table 3.13, and the loose time framework for completion of doctoral studies in Greece, it is unsurprising that Greek PhD candidates are usually older than their UK counterparts.

Table 3.11 Duration of higher education degrees in Greece and UK

Country	Bachelor	Master (Postgraduate diploma of specialisation)	PhD	Total years
Greece	4-6 years	1-2 years	3-6 years	8-14 years
UK	3 years	1 year	3-4 years	7-8 years

For Greece: Bachelor and MA: Bologna report 2009, PhD: Galanaki, 2002
For UK: Salinger, 2007, UK Bologna report, 2009

The absence of a regulatory framework of doctoral studies, the limited funding, and the increased duties beyond research and supervision characteristics (Galanaki, 2002 ; ELEPETYD, 2005) have been suggested as factors prolonging doctoral study in Greece.

At institutional level, there is a variety of doctoral programmes in Greece, some structured, some not (Kyriazis and Asderaki, 2008). Graduate schools have been established in UK universities to meet the challenges of doctoral education – as described in chapter two regarding the criticisms of the doctorate – among which is to reduce time to degree and non-completion. Different forms of organisation of doctoral education have recently emerged in European countries as well[90] which aimed to decrease the time to complete, as envisaged in the Bologna Process (3-4 years),

> *"time needed to obtain a doctoral degree in Europe used to be approximately six to eight years, but it has been reduced in recent years as*

[90] New organisational models of doctoral education and structured doctoral programmes[90] were introduced in several European countries since the 1980s at the national level such as Denmark, France and Germany. There is a variety of these structures ranging from 'graduate schools' - which is the most frequent - to 'doctoral/research schools' and 'research units/academies' (EUA, 2007; Mathieu, 1997; Kyvik and Tvede, 1998). The structured programmes can be organised either by institutions at faculty departmental level, doctoral/graduates/ research schools. According to a EUA study, there are three types of organisation of doctoral education: individual education, structured programmes in faculties or departments and doctoral/ research/graduate schools and possible combination of 2 or even all three types together in one country.

a result of the introduction of structured programs and schools and strict funding schemes". (Bitusikova, 2009, p.1)

Furthermore, in the UK, the PhD completion rate is one of the metrics of the current Research Excellence Framework (REF) – a predecessor of Research Assessment Exercise (RAE) – which influence the funding that the institution receives. On the contrary, Greek universities are not affected financially by indicators on PhD completion. It is only stipulated in Greek legislation that doctoral studies have duration of at least three years with no upper limit.

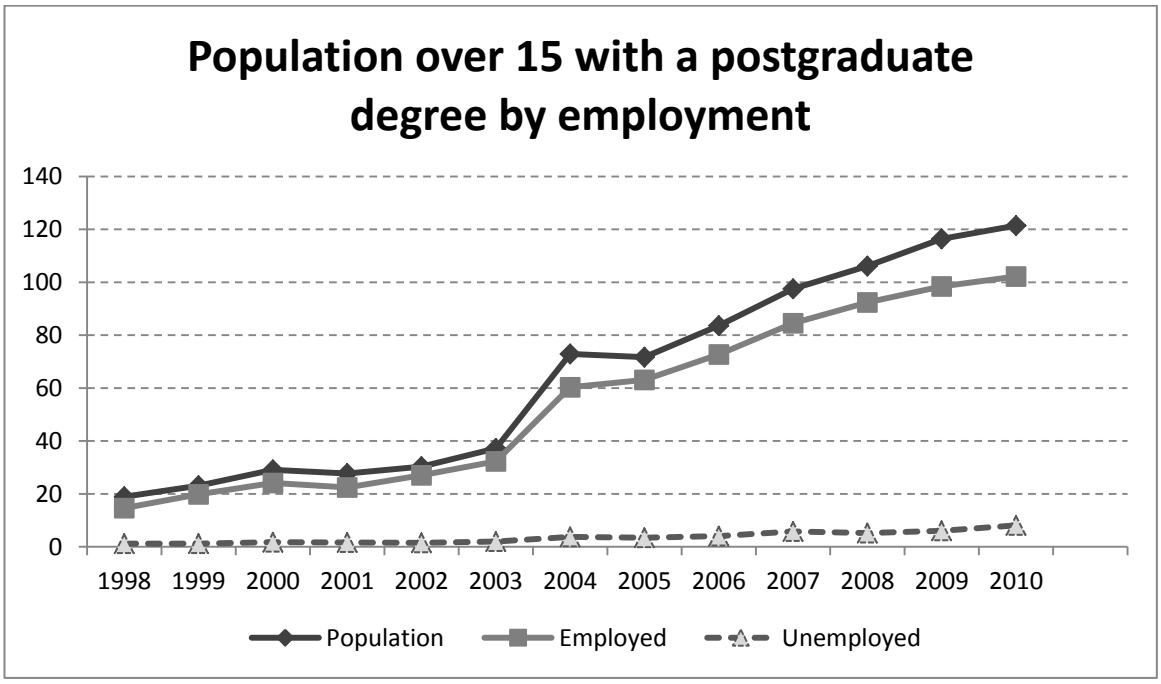
The Greek PhD seems to resemble more the US[91] – rather than the UK – in terms of both its 'indeterminate' (Zhao et al., 2007; p.264) and long duration. According to Hoffer et al. (2006), the average time to degree for US PhD graduates was found to be slightly over eight years with differences across the disciplines[92]. Thus, discipline, quality and characteristics of doctoral supervision are also important variables affecting time to degree[93]. Doctorates in natural sciences and engineering take fewer years compared to other disciplines, probably due to the greater availability of funding and the research cultures in these fields (Kehm, 2006; Altbach, 2004; Sinclair, 2004).

[91] However, doctoral studies in Greece do not have such a great emphasis on the taught component as it is the case in the US.
[92] Time to degree varied across the disciplines with the shortest being in physical sciences with the median being (6.7 years) and life sciences (7.1 years), while the longest appeared in education (13.0 years).
[93] It has been found that time to degree depends on the subject but also on the structures and organisation of doctoral education (Kehm, 2006; Altbach, 2004). According to Kehm (2006, p.70):'*In Europe, the time to degree varies considerably depending on the subject and on how the doctoral education and training takes place, that is, whether it is within the framework of a programme or school or if it follows the traditional master apprentice model.*'

3.4.3 Postgraduate education and labour market

Higher education has always been ‘popular’ both within the Greek political sphere for further socio economic growth and the public, considering it as a long-term investment towards better employment opportunities. Since higher education in Greece is usually free, there is a low cost of education and high expectations for returns in terms of a career with higher financial and social benefits. However, academic literature refers to ‘unrealistic expectations’ for prospective students and their families and a decreasing trend of investments in education (Lampropoulos and Psacharopoulos, 1992; Kanellopoulos, 1997; Tsakloglou and Cholezas, 2001) leading to phenomena of underemployment. While youth and graduate unemployment has been a growing concern for a number of decades, low levels of unemployment are observed for postgraduates in the last decade (see Figure 3.5). In 1998, 83.5% of 18,900 postgraduates were employed in the Greek labour market. The numbers rose throughout in the early 2000s with a significant rise in 2004, followed by further increase until 2010 reaching 121,400 postgraduates and an employment rate of 90.9%. The proportion of unemployment falling for about a decade (1999-2009) has risen again in 2010 – in line with the Greek crisis – to 7.4% (similar to figures for 1998).

Figure 3-5 Trends of holders of postgraduate qualifications in the Greek labour market. 1998-2010



Source: EL.STAT: Greek LFS, a 'quarter (in thousands)

Considering the average annual unemployment rate in 2010 was 12.5%, reaching 16.3% (9.7 for postgraduates) in the second quarter of LFS, it still compares favourably to the rates in terms of the overall unemployment rate. However, evidence on doctoral graduates is limited and derives mainly from LFS data with no qualitative research having taken place.

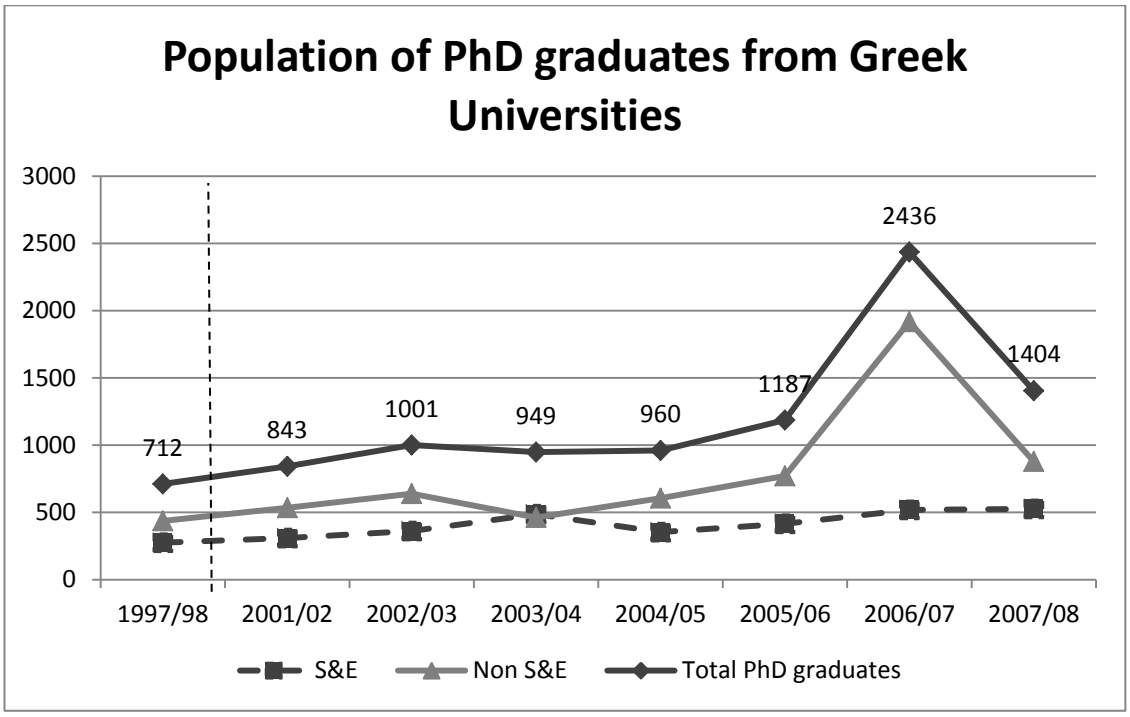
Greek researchers and PhD graduates have continuously increased in Greece over the past fifteen years (ERA – WATCH[94]; ELSTAT, various years). There is an additional inflow of Greek doctoral holders from foreign universities (500-600 per year according to the Greek NARIC) in the Greek labour market, while 400-500 doctorates were annually awarded to Greeks from UK universities between 2002-2008 (HESA statistics). The hosting capacity and the reputation

[94] For more see : http://cordis.europa.eu/erawatch/index.cfm?fuseaction=ri.content&topicID=74&countryCode=GR&parentID=71 , 04/08/08

of UK universities along with the familiarity of Greek students with the English language[95] render UK an attractive destination for studies (ibid; Eurostat, 2004).Greece had the highest share in the EU-27 in terms of S&E doctoral degrees, with 62% of total doctoral degrees conferred by Greek universities being S&E disciplines in 2005 (Moguerou and Pietrogiacomo, 2008,p.47).

According to ELSTAT, the population of PhD graduates from Greek universities has increased from 712 to 1404 between 1997-2007. There were some peaks in 2004/05 and 2006/07 which are related to greater number of graduates reported from engineering and medical disciplines.

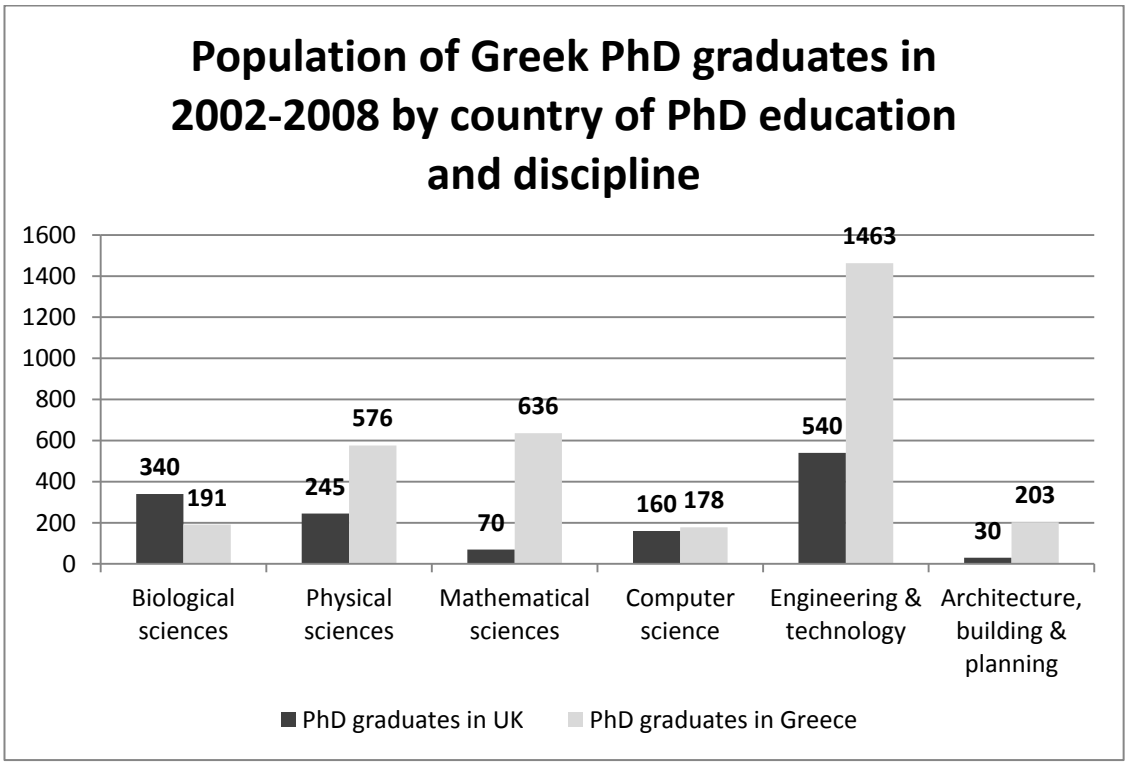
Figure 3-6 Population of PhD graduates from Greek universities



[95] 99.2% of secondary pupils in Greece know at least one foreign language – the most common being English.

In terms of gender, men outnumbered women PhD graduates in all disciplines in natural sciences and engineering apart from biological sciences. The number of Greek PhD graduates from UK universities in natural sciences and engineering has remained constant (200-250) during 2002-2010, comprising more than half of the total population of Greek doctorate holders from UK universities. Comparing the two populations, there was a greater share of females PhD graduates from UK universities (34% versus 20%). In addition, biological sciences were the second most-commonly studied disciplinary area in UK universities, where women outnumbered men and more doctorates were awarded to Greek students by UK than Greek universities (for more see Appendix IV).

Figure 3-7 Population of Greek PhD graduates by country of doctoral study and discipline



In a recent nationwide survey of graduates, Karamessini (2010) reported that postgraduate studies were more likely to affect the quality of graduate

employment – in terms of salary and relevance with education – 5-7 years after graduation. In addition, while postgraduate studies did not seem to influence the likelihood of employment versus unemployment 5-7 years after graduation, holders of postgraduate qualifications were more likely to undertake temporary employment rather than permanent. As the author explained:

> *"The negative effect of postgraduate studies on the odds of being in permanent versus temporary employment may look paradoxical at first sight. Yet, it is understandable if we consider that postgraduate studies postpone transition. Consequently, graduates who have accomplished their postgraduate studies are on average more likely to be in temporary employment in their first years of transition than their counterparts who have started their transition some years earlier and are more likely to have acceded to permanent employment" (p.27-28).*

3.4.4 The doctoral labour market

The Greek doctoral labour market has been largely unexplored despite the increasing importance attributed to doctoral graduates at national and European level. LFS data and a recent study of Greek PhD graduates (GSRT, 2008) are the main data sources on employment of this highly skilled workforce in Greece. Both sources are primarily quantitative without qualitative information on the perceptions of Greek PhD graduates, which is provided in this study. In terms of the LFS survey, Masters' and PhD graduates are not distinguished in the data unless primary data are provided. Livanos [96](2008) exploring LFS data during 2000-2004, found that 74% of PhD graduates were working in the public sector while 17% were in self-employment (2004, b' quarter). The predominance of Greek PhD graduates in the public sector can

[96] It should be taken into consideration though that the PhD graduates in the LFS data make a very small proportion of the sample.

be explained by the traditional perception of PhD graduates occupied in academic and research careers. In Greece, this tradition still seems to remain.

The GSRT study on Greek PhD graduates showed that the respondents of this study were mainly working in the higher education and public sector (41.4% and 23.8% respectively). On the contrary, only 11.6% of the study respondents were working in the private sector and 12.9% were self-employed. Therefore, there seems to be a limited number of highly specialised personnel with a PhD qualification working in the private sector. This evidence demonstrates the low unemployment rates of PhD graduates and the importance of the academic sector as the predominant employment destination. However, the increasing production of PhD holders along with the decreasing number of academic posts and the gloomy economic environment in Greece creates questions about the demand for these PhD graduates. In addition, employment indicators are useful in providing an overview of the Greek doctoral labour market, but it does not offer insights into individual careers and employment choices in this highly skilled workforce as qualitative research can do.

Often the doctoral labour market is distinguished between the academic and non-academic labour market. This distinction is adopted in the next section that introduces these two labour markets in the Greek context. The following section introduces the Greek academic market, – including Greek research institutions – which is regulated by legal frameworks, defining recruitment, selection promotion procedures and salaries. It also establishes that the Greek

non-academic labour market for PhD graduates is a neglected area in academic research.

The academic path

In Greece, the PhD is still considered as the path to an academic career. There are four academic ranks in Greek academia introduced by law (1268/1982): professor, associate professor, assistant professor and lecturer. Only the associate professor and professors' posts are tenured. As members of the research and teaching staff, they are civil servants and they are 'elected' by academics of the same or superior rank than the rank of the post they applied. Thus, the regulations about the procurement of the academic post, the procedures of their recruitment and the decision for their 'election' are stipulated in the legal framework 1268/82 (Law 1268/1982, pp.683-684, see Table 3.14). According to the law (Act 1268/1982; Act 1566/1985), the requirements a lecturer post are the following: two years of subject-related teaching experience in Greek or foreign institution, two innovative publications and one year of independent teaching[97].

[97] For specific information in the requirements, please see the legal documents: article 79. par.6 of law 1566/1985, FEK A 167, Law 1268/1982, Chapter E', Article 15, pp.683-684

Table 3.12 Recruitment procedures for academic staff in Greek institutions, Law 1268/1982

1. The General assembly of the educational institution identifies new vacancies for the needs of departments and schools. The senior leadership team decides on the creation of new academic posts and recommends them to the Ministry of Education. However, the Ministry has the final word whether it will allow the university or not to create these posts.
2. Publication of academic posts' procurement from the newspaper of the government and announcement from the daily press inviting applications
3. Communication of procurement for informing the scientists of the sector
4. 30 days after the last publication in the daily press, applications are submitted in the secretariat of the department with the required documents[1]
5. After the submission of the applications, the general assembly decides for the recommendation committee of the post which is comprised by 3 academic members of the institution
6. Within 40 days, the recommendation committee submits a report[1] with the presentation and evaluation of the work, the personality and the contribution of the candidates and their ability to meet the needs of the post
7. Academic members of the same rank or higher academic rank comprise the body of electives[1]. After the submission of the report of the recommendation committee, this body is meeting with general assembly of the department and a student representative who also evaluates the candidates. The body of electives vote and justify their vote
8. The candidate with 2/3 of the total votes is selected.

Lecturers are elected for a seven year period and their promotion is dependent on whether they meet the requirements of the next rank. This decision is based again on an election process for the next academic rank post where other candidates also participate. If another candidate is elected, then the term of the previously elected academic is ended. Assistant professors after the end of the three years that they are elected, they need to apply for tenure – before applying for the next academic rank – where their qualifications are evaluated. After getting the tenure, the same procedure as in the lecturer case is followed, in both cases of assistant and associate professors. However, if the assistant professor got tenure and was not promoted to the next rank, he/she has the right to be transferred in the public sector e.g. in public education/public research centre or civil service (see also Karamessini, 2004, p.13). The

primary criterion for being elected or promoted in an academic post is research publications especially in the early years of academic careers[98].

Since the post of lecturer requires apart from the doctorate a two year teaching or research experience, the temporary teaching post of PD/407 seems to be the most plausible next step for a Greek PhD graduate that might be interested in pursuing his/her academic career. Through this temporary post, PhD graduates obtain the required teaching experience and enhance their CVs. It was not until the 1980s that these temporary teaching posts were introduced in the Greek higher education system[99] to meet the emerging teaching needs of universities and cover the limited number of academic staff in the universities, which reflects to some extent the limited number of tenure track academic vacancies every year.

According to the Hellenic Statistical Agency (ELSTAT), there are small differences in the number of lectures and temporary teaching positions (PD/407) with the latter constituting a significant proportion of academic staff in Greek Universities.

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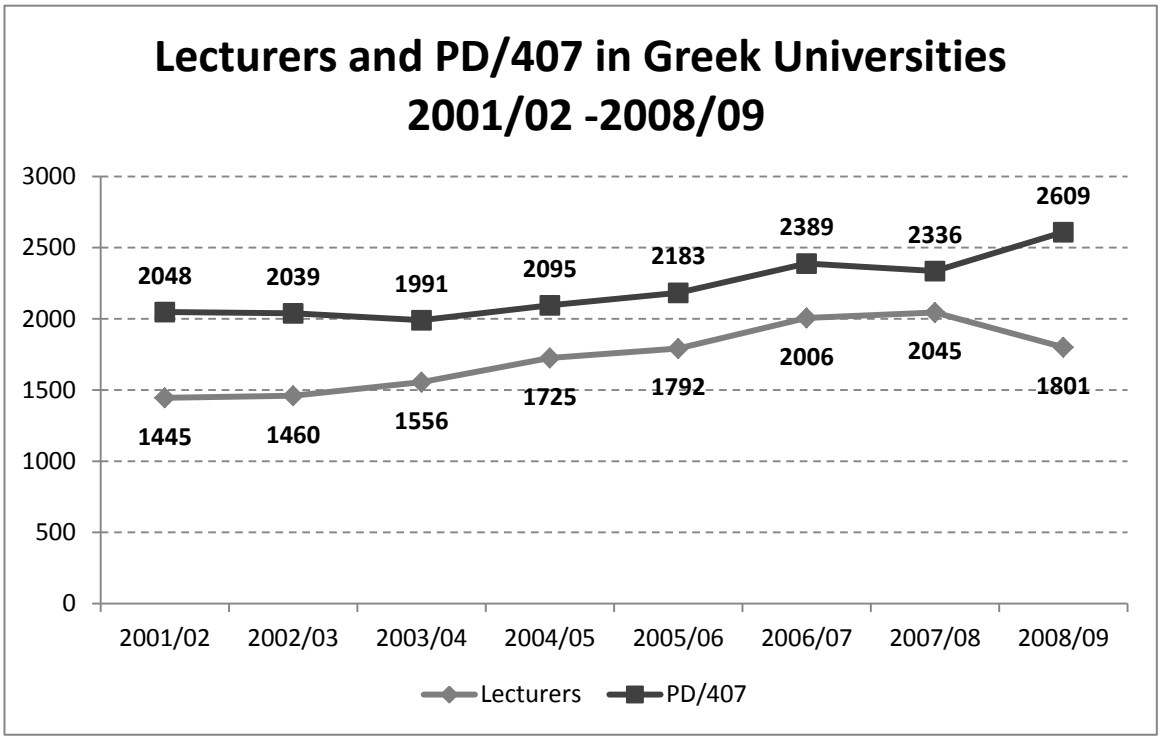
[98] However, anecdotal evidence suggests that this criterion is mostly evaluated in terms of quantity rather than quality. Additionally, teaching experience and reputation in the scholarly community are also important.

[99] These posts were introduced initially, in Crete (article 5 Presidential Decree(PD) 407/1980), the Rector or equivalent body of the University and the Polytechnic of Crete were allowed to provide fixed term contract teaching positions (yearly contracts renewable up to three years of total cumulative duration). According to this PD: PhD graduates or individuals with great technical expertise can be appointed by the Rector of the respective university or equivalent university body could undertake teaching, research or organisational responsibilities. This type of personnel cannot overcome the total number of the academic staff of the institution. These employees have the same tasks and obligations equivalent to the academic rank in which they have been appointed and they are thus paid accordingly. Often these posts are either in the lecturer or senior lecturer ranks. Subsequently with the law 1674/1986, article 2, the presidential decree 407/1980 was applicable for all Greek universities.

Figure 3-8 Number of lecturers and temporary teaching assistants in Greek Universities, 2002-2009



Source: ELSTAT, online.

Another employment option is to apply for a post in the Greek TEIs where requirements are not as high as in universities. Especially for natural sciences and engineering, these institutions offer degrees that are more pertinent to these disciplines. There is a similar hierarchy these institutions: Applications professor, Assistant professor, Associate professor, Full professor[100]. They are also civil servants and their recruitment procedures are comparable to the ones in the universities as set in the respective legal frameworks (1404/1983 and 2916/2001). The first two ranks enjoy tenure while the lowest ranks are initially appointed for three years after which they can request promotion to the next grade. Requirements are different for being elected in these posts since

[100] There are also the members EDIP of TEI are members of special teaching staff which are appointed for three years and offer special educational services regarding teaching of foreign languages or physical education. Their selection, appointment and tenure is defined by the same articles that the educational staff of TEI has (articles 16 and 17 of law 1404/1983)

the lowest rank of applications professor does not require a PhD[101]. Nevertheless, the doctorate can be utilised as a competitive advantage in these posts especially under the strong completion for university posts.

Karamessini (2004, p.14) identified three progression routes[102] for academic careers in Greece distinguishing between PhD graduates with a doctorate from Greek universities and those from abroad emphasising the importance of previous teaching and/or research experience for pursuing an academic career in Greece. Temporary teaching and research posts appear as necessary steps in the proposed trajectories. It is not explained how these routes were developed especially in relation to the country where doctoral education was undertaken. Nevertheless, the author referred to the higher prestige of the doctorate abroad versus the development of contacts and networks of the domicile PhD graduates.

[101] According to article 2, law 2916/2001, it is required: i)five years of professional experience at least in a subject relevant to the specialisation of the post, after the completion of a first university degree. This experience can include two years of teaching experience in universities or technological institutions in Greece or abroad, ii) proven ability of scientific knowledge application and technological methods or research project implementation in the area of specialisation of the advertised post.

[102] The three progression routes were the following (Karamessini, 2004, p.14):
Progression Route A: doctoral research at home – working as research assistant in university on formal or informal service contract – temporary lecturer on limited duration contract – lecturer- assistant professor – associate professor- professor
Progression Route B: doctoral research abroad – regular researcher in government research centres or institutes or temporary lecturer on limited duration contract – lecturer- assistant professor – associate professor- professor
Progression Route C: doctoral research at home or abroad – postdoctoral contract research position assistant in university or government research centres and institutes – lecturer-assistant professor – associate professor- professor.
It is not clear why the PhD graduates from abroad were considered undertaking postdoctoral posts and regular research posts than the PhD graduates from Greek universities.

The researcher in research institutes/centres

PhD graduates can also work as researchers in Greek research institutes which are often under the supervision of the GSRT. Similar to the academic paths, researchers are civil servants thus their recruitment, selection and promotion of researchers in these institutes are defined by law (1514/1985). It is stipulated (article 15) that the personnel in the national research centres and independent research institutes is distinguished in four research ranks. The grades and their prerequisites for appointment is provided in Table 3.15.

Table 3.13 Prerequisites of Greek research staff

Research rank	Prerequisites for appointment (minimum prerequisites)	Equivalent to UK research ranks (ref)
Δ' researcher or junior researcher (researcher under probation)	Knowledge and proven ability for responsible undertaking of a stage or part of a research project	Research fellow
Γ' researcher or senior researcher	Proven ability to design and implement research projects, allocate parts or stages of projects to other researchers who he/she guides or supervises, In addition, he is required to have done original publications in scientific journals of international recognised prestige	Senior research fellow
Β' researcher or principal researcher	Proven ability to organise and direct research programmes, coordinate research in individual projects of the research programmes and promote pioneering ideas in science and technology. In addition, it is required to have original publications in scientific journals of international recognised prestige and his contribution to the progress of science to be recognised by other researchers	Principal research fellow
Α' researcher or director of research	Proven ability to develop research in new sectors, to coordinate activities in wider research fields, to contribute in the research policy making, to be recognised internationally for his contribution to scientific sectors of his specialisation and have a rich publication record in monographs or articles in scientific journals of international recognised prestige	Professorial research fellow or full professor

For each rank, the previous prerequisites are also valid (e.g. to become a researcher B' you need to meet the prerequisites of researcher A'). In exceptional situations, scientists distinguished in their specialisation can be appointed for researcher A or B ranks without a doctorate. Depending on the rank, there is a committee that decides on the appointment or promotion of research staff into the predefined ranks explained in the table. According to law 1514/1985 (article 16) the decision on the appointment or promotion to researcher A or B is defined by a committee comprised mainly by researchers in the same specialisation as the candidate but from a different external research centre or institute. Respectively, for the two lower ranks (researcher Γ' and Δ)' the majority of the committee members are from same specialisation but they are members of internal staff of the institute where the vacancy has been emerged.

According to law 1514/1985, Δ'researchers are appointed initially with a 3 year 'service', as it is called. When this period comes to an end, then this member of staff can apply for a vacancy for researcher Γ' which will be advertised after the end of service. If another candidate (external) gets this job then he is dismissed. If he/she or other candidates are neither successful for the post, then he gets an annual renewal and the previous procedure is repeated. If he is not successful in this second time, then he should leave his post. For researchers Γ, there is a similar service and a similar procedure for promotion, but there are two renewals for the next two years. If s/he is not successful then s/he is dismissed.

Researchers in the two upper ranks A and B, are members of permanent staff. Researchers B, after a period of four years will be evaluated for their promotion in rank A. If they are successful, they become A' researchers, otherwise, they are evaluated again every three years. Similar to the academics' promotion and career progression, publications and the ability to coordinate, develop and direct research are crucial for PhD graduates aspiring to a researcher career.

Working conditions for academics/researchers

Table 3.15 provides a comparative picture of the monthly earnings between staff in HEIs and research institutes in Greece[103]. Extra financial benefits such as family, research/teaching and long experience benefits are not included in this table, which raise the monthly income of researchers and academics (40-50% of the basic salary) reaching up to 2,500 for the position of Professor/Director of Research.

Table 3.14 Academic and research ranks in Greece with monthly salary information (no benefits included)

Research staff rank	Salaries	University Academic staff ranks	Salaries (without benefits) (in Euros)	Technological educational institutions ranks	Salaries
Δ' researcher or junior researcher	1083	Lecturer	1132	Member EDIP or applications professor	1003
Γ' researcher or senior	1191	Assistant Professor	1245	Assistant Professor	1153

[103]In Greece, according to the law 1514/1985, ranks of research staff are equated to ranks of academic staff so there are same salaries and benefits from these categories. Based on the rank, salaries and benefits are different as there different rates used multiplied by the basic salary of the lowest rank which is the researcher Δ for the research staff and the lecturer for the academic staff. However, laws such as 3205/2003, 3336/2005 and 3453/2006 changed the basic salaries of lecturers and researchers Δ favouring the academic staff. The difference is not great but researchers used to have same salaries as academic staff, and then they were less favoured in subsequent legislation in terms of their salary.

researcher					
B' researcher or principal researcher	1408	Associate professor	1471	Associate professor	1304
A' researcher or director of research	1625	Full professor	1698	Full professor	1505

The non-academic labour market

No previous information regarding the careers of researchers in the Greek business sector is available (Karamessini, 2004[104]). The Greek state has undertaken an initiative (HERON[105]) in facilitating the transition of Greek PhD graduates in the business enterprise sector and fostering research activities in Greek companies. However, this project had limited results since only a small number of companies applied for such funding and a handful of them were successful.

Information is limited to quantitative data of researchers working in the business enterprise sector. According to the latest available data, there is an increase in the research personnel in the business enterprise sector, out of which is expected to be PhD graduates (see Figure 3.2). In addition, it is reported by recent data from the OECD (2009, Science technology and

[104] The author mentioned that the MOBISC study would provide evidence for the first time on this issue but no reports produced from this project referred to this issue at least in relation to Greece.

[105] HERON (2002-2007) was a project destined to develop research activities and increase awareness of Greek companies on research procedures and benefits as part of companies' growth. At the same time, it aimed at increasing the employment of research and technical personnel (including PhD graduates) in the private sector and develop synergies and cooperation between research institutions and companies. The project was funded by the EU (75%) and national funds (25%) and was part of the Competitiveness programme of Greece under the European Social Fund. It contributed towards the salaries of the employed personnel depending on the type of research activities undertaken by the company. No report was available on the results of this project. Nevertheless, after contracting the project manager of HERON, he explained that only a few companies applied and were successful in the project.

industry scoreboard) that during 1997-2007, Greece has achieved a growth of business sector researchers of more than 12% annually. However, the business sector researchers still have a small share in comparison to the researchers in HEIs and governmental research, which is unsurprising considering their dominant role in the Greek R&D system. However, it is assumed – due to research in other countries – that this highly skilled workforce might be employed not only in companies with R&D activities but also in activities that might benefit by the skills of this workforce (e.g. management consultancies, financial services etc.). While statistical evidence (EL.STAT - LFS; GSRT, 2008) shows that Greek PhD holders work as self-employed or working in the private sector, there is no qualitative information regarding the career paths of this highly skilled outside the Greek academic arena.

Other PhD occupations

In Greece, a PhD is a prerequisite for 'special scientific personnel' in the public sector which provide specialised advisory and consultancy services to ministries and public bodies. But, the number of vacancies for special scientific personnel is quite limited according to the yearly reports of ASEP.[106]Apart from this personnel, there are also many general posts where the PhD is recognised and rewarded in the public competitions. Master's and PhD qualifications provide extra credits to applicants for such posts. In light of the

[106] ASEP is the Supreme Council for Civil Personnel Selection (ASEP), which was established by Law 2190/1994 as an independent authority responsible for verifying the faithful implementation of the provisions on civil service staff hirings. ASEP is responsible for the undertaking of competitions but also for the control and verification of competitions undertaken by public bodies such as ministries, hospitals, local governmental offices: e.g. city, county councils, etc.

current economic crisis and the pressure for minimising the costs in the public sector has led, not only to salary and benefits cuts, but also to the redundancy of personnel.

3.5 Conclusions

Greece has a low technology-intensive economy dominated by SMEs, which are oriented towards a medium and low skilled workforce. In addition, a high graduate unemployment rate is a persistent characteristic of the Greek labour market. The strict regulatory framework of employment relations, the high demand on higher education and the skills mismatch between demand and supply are found to account for this phenomenon.

Despite the European emphasis on research and innovation and the national endorsement of such priorities from all member states including the Greek government, the Greek research and innovation system does not compare favourably to other European countries as demonstrated by research indicators. A plethora of weaknesses trouble Greek innovation and research such as the small share of private sector in research activities as opposed to the dominance of the public sector research, the high tendency of the business sector in adopting innovation, the limited presence of innovation ‘lighthouses’, the fragmented and discontinuous Greek research policy. At the same time, the limited cooperation of industry with universities and the fragmentation of research in the Greek higher education have also created bottlenecks in the enhancement of research and innovation. In contrast, the availability of highly skilled – including PhD graduates within Greece and beyond (Greek diaspora)

– constitutes strength of the system that can become a competitive advantage if utilised appropriately.

Although education plays a critical role in nurturing and developing such highly skilled workforce, the Greek education system and policy present deficiencies. Higher education has been criticised for the organisational, and personnel infrastructure apart from allegations for limited transparency, quality assurance and social accountability. Similarly to research policy, Greek educational policy has been subject to the successive changes of the government and the ministry of education. While many reforms have been introduced at secondary and higher education levels, their slow and sometimes limited implementation has reinforced the fact that the Greek educational policies are lacking continuity and long-term strategic planning in accordance with national priorities.

Greek universities appear autonomous in principle, but are limited in their decision-making on financial and staffing issues, in comparison to their UK counterparts. In addition, doctoral education in Greece, in contrast to European countries, has maintained the master-apprenticeship model and was not influenced by doctoral reforms, which aimed at improving the quality of PhD studies. This supervision model along with the limited funding available for doctoral studentships and the absence of a regulatory framework are included among the main reasons that lead Greek PhD candidates either to dropout or to extend their degree compared to those in the UK.

Although the number of postgraduate qualifications holders, including doctorates, is continuously increasing, it is doubtful whether the skills and knowledge of this workforce are in demand in the current labour market, especially under the current economic climate. Statistical evidence show that Greek PhD graduates are preoccupied in the academic and research sector, but there is also a proportion working in the private sector, in research and non-research functions.

The recruitment of PhD graduates in academic and public research posts is strictly regulated by legislative frameworks. The procedures are injected with bureaucracy preventing universities to meet emerging and non-scheduled needs in terms of personnel. In the 1980s, this was solved partly by the introduction of temporary teaching and research posts (PD/407), which complemented the academic personnel of HEIs. Nowadays, these posts appear to be a necessary step in the early career building experience of PhD graduates who are interested in pursuing an academic career. Nevertheless, the limited vacancies procured for academic and research posts in Greece – which might be minimised under the current austerity measures – and the temporary nature of the available early positions seems to lead to an early career experience infiltrated with strong competition and high uncertainty.

While these facts might decrease the attractiveness of traditional paths for PhD graduates, there is evidence that there is a small proportion working in the business sector in both research and non-research functions. However, the careers of PhD graduates are an unexplored area in Greek academic

literature. Quantitative information provides evidence on the sectoral distribution of Greek doctoral graduates, but it is not examined how and why PhD graduates are making these career choices and how the ‘demand’ side is viewing this highly educated workforce, especially in the business sector. This sector has many structural deficiencies that can prevent the utilisation of highly educated employees, not least due to its limited presence in the Greek research and innovation system. Nevertheless, efforts have been undertaken through European and national funded programmes to boost this sector’s participation in R&D activities providing an alternative career path for Greek PhD graduates.

Despite the small number of PhD graduates working in the Greek business sector, it is imperative to obtain insight into the perceptions of non-academic employers about this highly specialised group in light of evidence of the growing number of PhD students and graduates and the decrease in academic and public sector posts. No previous research has been undertaken regarding experiences and perceptions of doctoral graduates and employers in the private sector regarding the employment/recruitment of the former in Greece.

Chapter 4 THE RESEARCH PROGRAMME AND METHODOLOGY

4.1 Introduction

This chapter outlines the research design of this study, the methodology adopted, the research instruments used and the challenges presented by the choices made. It will start by introducing the mixed methods approach adopted in this study and explain how participants were defined: Greek PhD graduates who had studied natural sciences and engineering at Greek and UK universities; and the employers who recruit such employees. It also presents the methodological approaches adopted: the online survey; the interviews at early career stage with PhD graduates; and finally, the interviews with employers. Within these sections, the various stages undertaken before, during and after the data collection at each stage will be outlined (following Selltiz, Deutch and Cook, 1962)[107].

Following this, a brief introduction to the online survey respondents is presented and comparisons with the respective populations of Greek PhD graduates educated in Greece and UK are provided to highlight the similarities and differences of this study's respondents with the general population addressed.

The online survey was central to this study to provide an overview of the population, which has not previously been investigated. However, due to the

[107] Research methods in social relations, 1962.

difficulties experienced during the survey stage, emphasis shifted towards the qualitative stage in order to contextualise the data from the survey and explore further issues that emerged from the study. The quantitative data was employed as a useful sampling frame to select sub-samples and facilitate the qualitative phase of this research.

4.2 The analytical framework of study: Mixed methods

The mixed methods' approach is considered suitable for research questions regarding *'process and dynamic phenomena'* (Curall and Trowler, 2003, p.521). Career paths are complex and dynamic phenomena thus, mixed methods were chosen as the most appropriate means of addressing the research questions in order to contextualise the quantitative data gathered in the initial phase of this study.

As Tashakkori and Creswell (2007, p.4) report mixed methods research is:

> *"research in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches and methods in a single study or program of inquiry".*

This approach through the different methodological tools and sources of data enables and enhances the understanding of complex phenomena (Tashakkori and Teddie; 2003). Mixed methods are often used to *'offset the weaknesses of both quantitative and qualitative research'* (Creswell and Plano Clark, 2011; p.12). For example, quantitative methods have been often accused of overlooking the context where people act and the understanding of individuals. The researcher acquires a different role with each method. In quantitative research, the researcher is passive whereas in qualitative research is often

accused for possibly being more active than required, introducing personal bias and interpretation.

While the online survey has provided a general understanding of the doctoral education, the current occupation and career, the interviews provide richer, detailed information facilitating the contextualisation of these data, their further analysis and deeper understanding. Both quantitative and qualitative methods have limitations. While interviews only prevent the researcher from making generalisations, the online survey does not consider individual perspectives and understandings of each respondent. Thus, by combining both quantitative and qualitative tools, the methods can complement each other and overcome each other's limitations (Johnson and Onwuegbuzi, 2004). The online survey data solely provide fractions of information, which are enriched to some extent by the qualitative data (Creswell and Plano Clark, 2011). While quantitative studies provide an overview of the target group addressed, individual detail is limited.

Mixed methods were also important to maximise the participation and engagement levels of stakeholders in this study, namely the employers and the PhD graduates. Previous social science studies have highlighted the challenges of undertaking social research in Greece (Makridakis et al., 1997; Bourantas and Papadakis, 1996; Bourantas et al., 1990). Papadimitriou[108] (2011, p.31) noted these challenges and concluded that the use of mixed

[108] Papadimitriou (2011) in her thesis, examines the quality assurance and management in Greek higher education institutions using a mixed methods approach which included a range of tools such as two different small scale surveys interviews and content analysis of media articles and EUA quality reports.

methods in her own research was justified in overcoming these challenges. For instance, she stated:

> *"Greece is an environment that is internationally notorious for its difficulty for conducting empirical social science research: accordingly, very low levels of cooperation have to be expected".*

Several large scale surveys have been carried out in France, Germany, Austria, Belgium and UK investigating the employment situation of PhD holders (Enders, 2004; Calmand, 2011; Joseph et al., 2008; Schwabe, 2011;). These surveys together with initiatives by governmental agencies and research institutions have informed the research design techniques of the quantitative part of this study. Purcell et al. (2008) have highlighted the value of mixed methods research in the UK context that large scale surveys – such as the long established DLHE survey – should be complemented with more qualitative research on a subsample of respondents. The importance of mixed methods' research has also been illustrated by other studies explaining career paths and choices of undergraduates (Purcell et al.2005; Nerad and Cerny, 1999; 2002; Purcell and Elias, 2006). Nerad and Cerny (1999,p.2) in their study of investigating the career paths of US PhD graduates ten years after their award decided to complement a survey of about 6.000 responses with 64 interviews in order *"to provide information within which career decisions were made".* Following these studies, this project has adopted a similar research framework.

The research methodology included a survey of two matched samples of doctoral graduates who have undertaken their doctoral studies in Science or Engineering in Greece and the UK, plus interviews with graduates from

surveys and interviews with employers (both from Greece and the UK). Before looking at the survey and the interview tools, it is important to explain the identification of the population of interest further.

4.3 Defining the study population: PhD graduates and employers

Statistics on Greek PhD graduates of all disciplines are collected by the Hellenic Statistical Authority (EL.STAT.) and Higher Education Statistics Agency (HESA) to provide information on the populations from Greek and UK universities, respectively. Furthermore, since EL.STAT provides limited information on the population of Greek-educated PhD graduates, a recent survey on Greek PhD graduates by the General Secretariat of Research and Technology (GSRT, 2008) is used as a complementary source of data for this group (see Appendix IV).

The cohorts chosen were 2002-03 to 2007/08 as providing the potential for 'early' careers analysis of doctoral holders to move beyond information of temporary employment/ further education (postdoc) that study of more recent graduates would provide. In order to identify the populations, the data were filtered for these years and in the disciplines falling within natural sciences and engineering according to the latest edition of the Frascati manual[109]. Within the

[109] The Frascati Manual has been the outcome of a series of national attempts (by UK, US, Canada, Netherlands, etc) undertaken under the aegis of OECD to standardize research efforts related to collecting statistical data on R&D with a view to make international comparisons possible. While the first edition of the Manual was published in the 1963, there have been a few revisions on the Manual in order to meet changing needs in R&D sector and improve data collection on R&D issues at international level. From its very beginning the Manual covered only the natural sciences and engineering (first two editions) while among the aims of later editions was the expansion of the scope of the Manual to cover research in the social sciences and humanities. Due to the changes in the science and technology with the

following section on the online survey, more information will be provided on the construction of the sampling frame of this study.

Ideally, the population of employers that would be of interest in this study would have been dedicated employers of PhD graduates in the Greek and UK labour markets. Traditionally these employers would predominantly be academic institutions and research institutes. However, this study focus was also concerned with non-academic employers in order to understand the value of the doctorate in a different workplace context beyond the traditional academic setting. Comparing UK to Greek employers, the former seem to be more proactive in recruiting and targeting PhD graduates and thus it has been easier to identify them. On the contrary, there was no information on Greek employers and their attitudes towards this highly skilled workforce. In the section 4.5.2, it is explained how employers were identified and under which criteria.

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emergence of technological fields such as biotechnology, nanotechnology, the Working Party of National Experts on Science and Technology Indicators (NESTI) set up a task force to review the field of science and technology (FOS) classification in 2002. Despite the different viewpoints of the scientific committee, a compromise was reached in 2006.My research focuses on the natural sciences and engineering and the list used above is based on the revised field of science and technology classification for the major fields of ' Natural Sciences' and 'Engineering and Technology'. According to the revision of Frascati manual the following classification is used. Natural sciences :Mathematics, Computer and information sciences, Physical sciences, Chemical sciences, Earth and environmental sciences, Biological sciences, Other natural sciences Engineering and technology: Civil engineering, Electrical, electronic and information engineering, Mechanical engineering, Chemical engineering, Materials engineering, Medical engineering, Environmental engineering, Environmental biotechnology, Industrial biotechnology, Nanotechnology, Other engineering and technologies.

4.4 The Online survey

4.4.1 Access and sampling frame

Graduates who studied in Greece

The study included six cohorts[110] of doctoral graduates (2002-03, 2003-04, 2004-05, 2005-2006, 2006-2007 and 2007-2008) in natural sciences and engineering. According to the Hellenic Statistical Authority, the total population in these years was 3247 PhD graduates. After further investigation and assessment of feasibilities, it was evident that there was no database of the whole population of Greek PhD graduates from Greek and UK Universities, thus making random sampling impossible. The most comprehensive information about PhD graduates from Greek Universities was drawn from the Register of the National Documentation Centre where access to their database was ensured. While Greece does not have a well-established system of career services and alumni offices, doctoral graduates are legally required to submit a copy of their doctoral thesis to the National Documentation Centre (NDC) of Greece through the secretariat of their department. In this submission, contact information such as address, telephone number or e-mail is enquired. Today, the National Documentation Centre holds an archive of 15,000 doctoral theses, of which 85% were theses completed within Greek Universities and 15% by Greek doctorate holders who obtained their doctorate abroad[111]. It is estimated that approximately 75% of the total doctoral graduate population

[110] Looking at the number of science and engineering doctoral graduates of these cohorts, it is obvious that the proportion of this group is increasing in comparison to the total doctoral graduate population (36% of total doctoral graduates were awarded a science and engineering doctorate in 2002-03 whereas this number reached 51% and 62% in 2003-04 and 2004-05 respectively)

[111] They need to have the formal recognition requirements from the Hellenic NARIC.

fulfil this legal requirement to provide information. While the National Documentation Centre had a large database with the PhD graduates' names and their doctoral subjects comprising about 75-80% of total doctoral population in Greece, the contact information was not digitalised and not always completed, since providing contact information was optional. After scanning through the latest 5.000 census documents with the help and guidance from the secretariat of the NDC, a list of 1235 S&E doctoral graduates (representing 38% of the population) was built, out of which email addresses were found for 534 PhD graduates, while for 701 the contact information was missing. Postal addresses were included in these records but the costs associated with a postal survey were prohibitive.

To obtain the missing and outdated contact information, efforts were made using mainly web searches. A number of different internet resources were employed such as Google, Google scholar, LinkedIn, GRnet, TEE.gr, Facebook (see Appendix IV). Contact information (mainly e-mail addresses) was retrieved for 719 PhD graduates. The survey was sent using this information of which 79 email addresses were invalid. This was a time consuming and resource intensive process and effort invested was enormous. Email identification varied across the different persons and could last between two minutes to 30 minutes. If the person in question had been very mobile or had published a large number of papers, it was important to track the most recent institutional affiliation and the respective email address.

At the same time, a small database of curriculum vitae and personal webpages was created for further analysis (see section 4.5.2). In total, 85 CVs, 58 were collected through web searches and 27 were sent by the interviewees. These provided interesting information on the career paths of these Greek PhD graduates.

Greek graduates who studied in the UK

According to HESA data, 1380 Greek students obtained their doctorate in S&E fields at UK Universities in the same cohorts (2002-03, 2003-04, 2004-05, 2005-06, 2006-07 and 2007-08). Greek PhD students were mainly alumni of 'old – traditional' UK Universities, reflecting the subjects studied, and 15 universities agreed to help – as will be shown below – representing about 45% of the UK-educated Greek PhD graduate population according to HESA data.

Retrieving information for doctoral graduates from UK universities was challenging and not as straightforward as it was for the Greek doctoral graduates. Due to the Data Protection Act[112], institutions were not able to provide personal information to third parties and sometimes it was apparent that some universities did not have a comprehensive unified database of PhD graduates at university level. The different organisational and departmental structures of universities did not allow for a unified approach for all universities. What seems to be common, though, for this specific population, is that the

[112] According to the Data Protection Act 1998, it is prohibited to pass on personal data. According to the Information Commissioner's Office personal data are defined as data which relate to a living person who can be identified from the data or from the data and other information in the possession of, or likely to come into the possession of the party holding the data. For more information on the Act: http://www.legislation.gov.uk/ukpga/1998/29/contents

majority of Greek students in S&E have obtained their doctorates from well-established research centres (as shown by HESA statistics). Moreover, these universities not only have well established alumni databases, but also many have created alumni groups classified by geographical area or broad subject area. In more than 20 of these universities, alumni offices and organised Greek alumni groups were identified and contacted. Initially the enquiry was simply to establish to what extent their databases cover the majority of Greek alumni doctoral graduates and whether they could forward the online questionnaire of this study to their members. A similar approach with formal letters has been adopted for Alumni offices in some universities. Greek alumni representatives and alumni offices from fifteen UK universities[113] agreed to forward the mail to their members with the invitation and the link to the questionnaire. Three universities did not have email contact information. Instead, invitation letters with envelopes were sent to the alumni offices who agreed to send it on my behalf. In order to facilitate these PhD graduates, the link for the survey was abbreviated to a very generic and easy to write in an internet browser. A service within the University of Warwick was used that offers the possibility to create redirects to some long and complicated web links.

Other sources were also approached to help with the identification of this specific group of UK-educated Greeks, including the British graduates' society

[113] Warwick university, Imperial college, Birmingham university, London school of economics, Cambridge university, university of Edinburgh, university of Loughborough, Newcastle University, university of Surrey, King's College, university of Liverpool, university of Nottingham, university of Southampton, university of Manchester and Essex university.

in Greece and the Hellenic NARIC[114]. Both forwarded an email with the aim of the study and the relevant link for the online questionnaire, but a limited amount of respondents were identified. The National Scholarship Foundation (IKY) in Greece was not able to help due to lack of a comprehensive database of Greek postgraduates (funded to study abroad) in the years and the disciplines required.

To address these challenges, snowballing was used to overcome – to some extent – the challenge of identifying this highly skilled group of participants and thus enhance the response rate of the study. This involved asking survey participants in the webhost and HTML surveys to provide email contact information and/or forward the questionnaire to friends, colleagues and acquaintances that met the sampling requirements. Snowballing and theoretical sampling have been used successfully for qualitative research in the past (see Bryman, 2004). Nevertheless, it seems to have been considered justifiable when combined with quantitative research if the aim was to identify connections and relationships between people, which might yield better results than probability sampling (Bryman, 2004; Coleman, 1958). The targeted respondents belonged to a clearly defined membership group – in a relatively small population – and they were selected according to narrowly-specified

114 The Hellenic NARIC holds a database with contact information from Greek doctoral holders from foreign Universities who have applied for recognition of their qualification. The (NARIC) in Greece provides statistics on the foreign doctorates that are recognized each year (2005=527, 2006=605, Hellenic NARIC, http://www.doatap.gr/ 04/08/08) which are almost half of the annual 'production of doctoral graduates' in the interior of the country. However, the statistics are dependent on 1) Greeks who studied abroad, return to Greece 2) that they need the recognition of the degree to facilitate their access to the Greek labour market (which is mostly the case if somebody wants to work in the public sector, private sector might not ask for recognition especially for qualification from prestigious universities.

criteria on the basis of a) having acquired a PhD during 2002-2008, b) being Greek, and c) having studied a narrow range of subjects. Furthermore, the focus of the questions was predominantly on the subject of career rather than personal or attitudinal so it was felt that the use of such networks was unlikely to lead to response bias or present serious undermining of the representativeness of the achieved sample. The table below summarises the relative size of the population defined by national and institutional sources and the achieved sample of eligible cases.

Table 4.1 Achieved sample and population information

Greek PhD graduates in natural sciences and engineering during 2002-2008	Greek-educated	UK-educated
Population of Greek PhD grads from universities in natural sciences and engineering	3247 identified by EL.STAT	1380 identified by HESA
Coverage of national data source	1235 (38% of 3247) cases identified through NDC	626 (45% of 1380) cases identified through 15 UK universities that agreed to participate
Received questionnaires	194	50
Received questionnaires as % of the population	6	4

Due to the difficulties in identifying and contacting PhD graduates that fell in the population of interest for this study, the sampling frame and the response rate cannot be defined. Although the sample of this study is not a representative sample, it is a reasonable sample of cases which allowed the selection of sub-samples for more detailed investigation and further interpretation of these cases.

4.4.2 Preparation of the online survey

Tool for the questionnaire

After an evaluation of online tools (including Questionmark perception, Survey monkey and SNAP) SNAP was selected for this study. SNAP is a reliable instrument that has been widely used in the Institute for Employment Research (IER) for research purposes. It was considered as the most appropriate in terms of ensuring data security and protection of the participants. SNAP is a sufficiently sophisticated tool for the purposes of the analysis undertaken and scale of the sample. Familiarity with the tool was required in order to maximise its benefits. The questionnaire was developed step by-step drawing on relevant studies with online surveys to ensure that key research questions were addressed and that well-tested instruments had been used on larger studies. For example, the Longitudinal Destinations of Leavers for Higher Education (L-DLHE) with which I was familiar.

A small exploratory survey was conducted early in the study on the preferences of Greek researchers towards surveys, aimed at testing the methodological challenges to enhance the response rate of this study[115]. This was achieved through participation in a PhD symposium at London School of Economics[116] (LSE) that had a high concentration of Greek PhD researchers. Although the sample was small (n=31), it was a useful exercise. The responses indicated that there was a high preference for online surveys (90%)

[115] In Appendix IV, more information on the survey results is provided.
[116] The 4th Biennial Hellenic Observatory PhD Symposium on Contemporary Greece and Cyprus is inviting young scholars to present their research on issues related to Greece and Cyprus. It is conducted every two years and it concentrates a large number of primarily – although not excluding foreign - Greek doctoral researchers undertaking a doctorate in Greece and abroad.

and Greek PhD researchers recommended the use of reminders (58%) to enhance the response rate. In addition, less than half of the respondents indicated that an incentive would 'enhance their willingness' participate in a study. Fifteen respondents preferred a reward related to their research e.g. subscription to a research journal, while access to research findings was also considered a good idea. Most of these findings were adopted in an effort to maximise the response rate as identified as challenging in previous studies.

The survey was developed in English and then translated into Greek, which was the language version for the online questionnaire. Greek was preferred since it enabled participants to reply in their mother tongue and potentially yield more responses than an English version of the questionnaire would.

4.4.3 Design of the questionnaire: Questionnaire themes

The questionnaire has five sections. The first section was concerned with information about doctoral education, for example the year of the PhD award, the country and institution of doctoral studies, the discipline of the PhD etc. The second referred to current employment situation asking about characteristics of employment in terms of salary, basis of employment, type of organisation and use of PhD skills and knowledge in the workplace. The third section aimed at gathering career path information, asking participants about their first and most recent activity before their current employment. The inclusion of a full work history section was considered but rejected on the basis that it might discourage sustained participation by adding to the length of time

required to complete the survey[117] and because of presented technical difficulties for inclusion by the SNAP software. The fourth section was divided into two parts: the first concerned with the degree of career satisfaction up-to-date and the second included six opinion statements asking participants to express their degree of agreement/disagreement. The last section provided useful demographic information about the sample.

Each section was developed on the basis of the research questions with a view to provide information on specific issues that were hypothesised to be related to career paths of Greek PhD graduates. The content of the questionnaire was based on previous surveys on graduate labour market studies and doctoral education and its outcomes (Purcell and Elias, 2006; Purcell and Elias, 2004; Brown et al, 2010). Since no previous studies had been conducted in Greece on PhD graduates (the GSRT survey was not available at the time of the questionnaire design), few questions and responses were added to reflect the Greek contextual background.

A copy of the questionnaire is provided in Appendix I but it is important to note that it was an online and interactive survey. The survey was designed to vary in style of presentation alternating questions, as drop down menus, multiple choice and open-ended questions in a balanced way to ensure that it was not only user-friendly but also maintained the interest of respondents to achieve a high response rate.

[117] The challenges of collecting full career histories using an online survey were reported in a study of continuing vocational education and training across ten countries in Europe (see Brown et al., 2010). Qualitative interviews were conducted and found to be more successful in collecting this information.

4.4.4 Pilot survey and the timeline of the survey

Piloting the questionnaire

The online questionnaire was tested both in qualitative and quantitative terms. From a qualitative perspective, interviews on the basis of the developed questionnaire were undertaken with two Greek PhD graduates in science and engineering from recent cohorts of the University of Warwick. Each question of the questionnaire was explored with the interviewees, who filled them in discussing, so that any problems in understanding or misconceptions could be identified and addressed[118]. At the same time, more detailed information was asked on their career path and their career choices so far to understand to what extent the questionnaire could capture such data. Some suggestions were made which were implemented in the final revision of the online questionnaire.

From a quantitative perspective, a pilot survey of the online questionnaire was undertaken in May-June 2009. As a consultative exercise, since the questionnaires were produced in both UK and Greek languages, the links for the pilot were sent to an opportunity sample of both Greek and non-Greek respondents who either were undertaking a PhD (in relevant and non-relevant fields) or had expertise with SNAP and online questionnaire tools, or were recent PhD graduates.

There were nine questionnaires from non-Greek respondents and 12 from Greek respondents. The survey was tested in both versions (English and

[118] This approach is similar to that *of c*ognitive interviewing as espoused by Campanelli (1997).

Greek) since the aim was not only to test the content but also the structure, its logic and the potential for analysis. Through the pilot, the sequence and logic of questions were checked and questions with multiple choices were modified to minimise the number of options that might tire the respondent without losing important options. In addition, some mistakes were identified and minor changes were undertaken (including time required for the completion of the questionnaire in the introduction, font change[119]) in the language and the format used (alignment, punctuation, vocabulary).

After the pilot, a final questionnaire was developed through two identical surveys:

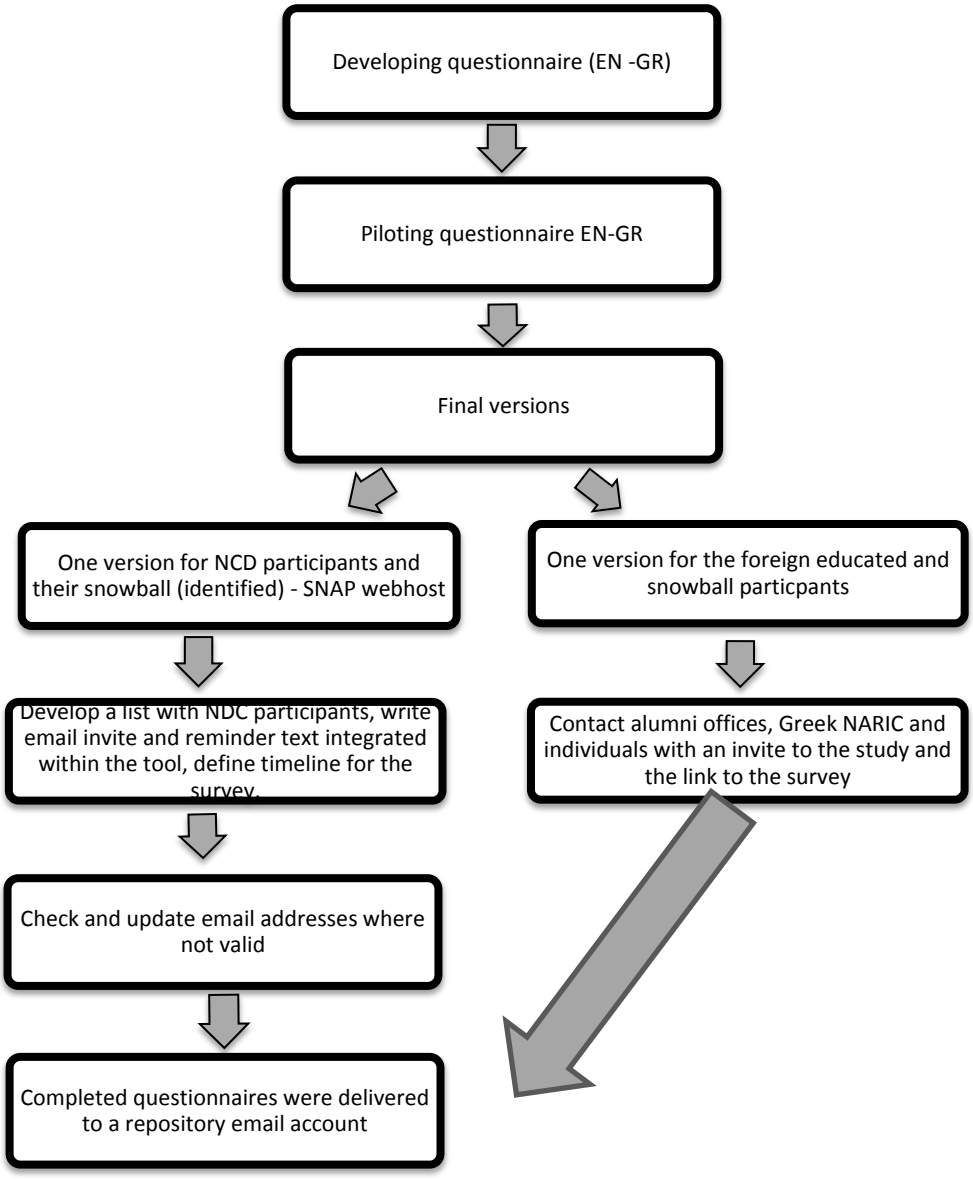
- **one published with SNAP webhost[120] (for the PhD graduates from the Greek Universities that were identified from the NDC) and**
- **one published within University of Warwick system for the foreign-educated students and the students that participated in the survey through snowballing techniques. Please see below and in Appendix IV for more information about the decision for using SNAP webhost and the problems associated with this.**

Whilst the questionnaire was expected to be launched at the end of September, on-going problems with the SNAP tool (please see specific report) emerged regarding the Greek language settings. Through continuous efforts and cooperation with IT assistance from University of Warwick and SNAP technical assistance, the questionnaire was launched in mid-November 2009. A month was given to participants to complete the questionnaire and two reminders were sent after 14 days and seven days before the close of the

119 Looking at research surveys about preferred fonts which facilitate reading on computer screens, sans serif fonts were the most preferred ones (Bernard et al., 2002) and Ivory and Megraw, 2005). More specifically, Bernard et al., (2002) concluded that Verdana (12 for the questions, 14 for the titles) was the most preferred which was the one used in the survey.
120 Please see Appendix IV for the SNAP webhost.

survey (end of December). Due to the small response rate and the continuous effort to retrieve a greater number of valid email addresses, the survey remained open until the end of January. The following figure gives an overview of the online survey process.

Figure 4-1 Process of the online survey



Challenges before and during the survey

A list of email contact information of Greek PhD graduates from Greek universities was developed and imported into SNAP with a unique ID name. At the same time, it was important to use the email invite feature of SNAP writing the text for inviting participants to the survey because SNAP could connect the list of respondents with the email invite text including a unique URL link of the online survey for each potential respondent. Therefore, this feature was critical since it allowed monitoring participation and response of the listed participants while reminders were only sent automatically (by SNAP) to the ones identified as non-respondents. However, the email invite text did not permit Greek characters resulting in an ineligible email sent whenever tested. After some negotiation, SNAP webhost – a paid service provided to SNAP clients – was used to enable email invites in Greek to be sent, and the monitoring of responses and participation. This problem delayed severely the launch of the online survey since the webhost service required training and familiarity for the successful launch of the survey.

On submission, completed questionnaires were sent to a repository separate email account accessible only by the researcher. Questionnaires from both surveys were imported from the repository account to the SNAP and then exported to SPSS. However, Greek language problems persisted with SPSS and the conversion of the responses into SPSS variables. SPSS did not recognise Greek characters. After further communication, the data were exported from SNAP in CSV format, then into Excel and then imported into

SPSS. Unfortunately, these conversions did not allow for automatic coding of the responses in the variables section in SPSS. The English and Greek surveys were merged into one database in SPSS.

4.4.5 Data analysis of questionnaire results

The survey data were analysed using SPSS software, with new variables constructed on the basis of the responses and a range of descriptive analysis were undertaken (see Appendix IV). In addition, factor analysis was employed to explore job satisfaction of the sample respondents with specific aspects of employment. Factor analysis also enabled the comparison of groups (employed in Greece – abroad, employed in the academic sector – non-academic sector) through the use of t-independent tests.

Challenges

On the assumption that most PhD graduates would be in professional occupations (since the unemployment rates for this group is amongst the lowest for graduates) (ESYE, 2008) with busy timetables, reaching a high response rate posed some challenges. Reminders were found to have a positive effect on the response rate (Kaplowitz et al., 2004), so two reminders were used in this survey. Other suggested ways of increasing response rate have been to provide monetary incentives. Bryman (2001) mentions that payment with participation rather than the promise of money once the questionnaire has been returned has proved to be a more effective incentive. However, this was not a feasible option for this study. Instead, an incentive related to research (participation in a lottery for an annual subscription to a

research journal of the winners' choice) and promise of access to the findings of this study were offered.

4.4.6 The sample characteristics: demographics and doctoral education

In this section the demographic profile and the main doctoral education characteristics of the online survey's respondents are described. This section will introduce the main attributes of the sample respondents before continuing to explore their educational and employment choices during and after their doctorate.

The gender and age group distribution of the online study are summarised in the table below. Information about broad disciplinary group and the country where the doctorate was acquired is also presented. A drawback of the online survey was the low response from of PhD graduates that have studied in UK universities who comprise only 20.5% of the achieved sample, which is four times smaller than those from Greek universities. This was mainly due to the difficulties in identifying and contacting such students given the lack of a comprehensive database of Greek PhD graduates who had studied at UK universities. For both Greek and UK-educated students, difficulties in access were further amplified by the dated and unreliable contact information.

The sample includes doctorate holders that were awarded their PhD during 2002-2008 which is a fairly broad range and there is not an equal representation across the different years skewed towards the 2003 to 2006 cohorts (see Appendix IV).

Table 4.2 Profile of respondents in the online study

	PhD education in Greece (79.5%)	PhD education in the UK (20.5%)
Gender		
Male	151	36
Female	43	14
Age group		
Less than 25 years old	1	0
26-30 years old	1	5
31-35 years old	73	31
36-40 years old	73	8
41-50 years old	27	2
Over 50 years old	12	0
PhD discipline group		
Natural sciences	92	24
Engineering & technology	68	20
Natural sciences & engineering	34	6

Online survey respondents show a broadly similar distribution with the population distribution in gender terms, to male respondents constituting 76.6% of total respondents while women were only 23.4%. According to HESA and Hellenic Statistical Authority (ELSTAT), the respective population of PhD graduates in the UK was 31% female and 69% male and in Greece 22% female and 78% male. Taking into consideration that this study focused on natural sciences and engineering disciplines that are male dominated subjects (EC, 2009; UNESCO, 2006), the low representation of women in the sample respondents is unsurprising. In this study, women were less represented in the engineering and technology disciplines (15%) compared to the other disciplinary groups who reached 25-30% of the sample.

In this study, respondents from natural sciences represent almost half of the sample while engineering and technology has a high proportion.

Table 4.3 Disciplinary profile of survey respondents (broad disciplinary area)

PhD disciplinary group	Frequencies	Percentages (valid)
Natural sciences	116	47.5
Engineering and technology	88	36.1
Natural sciences and engineering	40	16.4
Total	**244**	**100.0**

A closer look at the disciplines indicates that three disciplines were more frequently chosen as one of the subject areas of their PhD: electrical, electronic and information engineering, biological sciences and computer sciences.

Table 4.4 Disciplinary profile of survey respondents

PhD discipline	Frequencies	% of cases
Electrical, electronic and information engineering	54	22.4%
Biological sciences	43	17.8%
Computer sciences	41	17.0%
Physical sciences	25	10.4%
Chemical sciences	20	8.3%
Civil engineering	18	7.5%
Earth and environmental sciences	16	6.6%
Chemical engineering	16	6.6%
Maths	15	6.2%
Materials engineering	14	5.8%
Mechanical engineering	12	5.0%
Nanotechnology	9	3.7%
Environmental engineering	6	2.5%

Medical engineering	4	1.7%
Industrial biotechnology	2	.8%
Environmental biotechnology	1	.4%
Other	17	7.1%
Total	**315**	**130.7%**

In order to gauge the degree of interdisciplinary research undertaken by Greek PhD graduates and since there is an increasing emphasis on interdisciplinarity of doctoral education (see Boud and Lee, 2009), respondents were able to indicate that their doctorate was based on more than one scientific field.

Moreover, inspecting the degree of interdisciplinarity of the PhD degrees of the study respondents, there is a significant difference across the disciplines. More than half of the respondents in each discipline – computer sciences and physical sciences –completed an interdisciplinary subject. The highest degree of interdisciplinary appears to be located within engineering subject areas such as material engineering, medical engineering and nanotechnology reaching up to 70-75% but these subsamples are quite small.

Looking at first and doctoral degree, there is limited disciplinary mobility between the first degree and the PhD degree for the study participants also in line with the finding from the Greek register study (GSRT, 2008)[121]. However, the GSRT study (ibid, p.123) reports that there had been some mobility between physical sciences graduates towards pursuing a PhD in medicine or

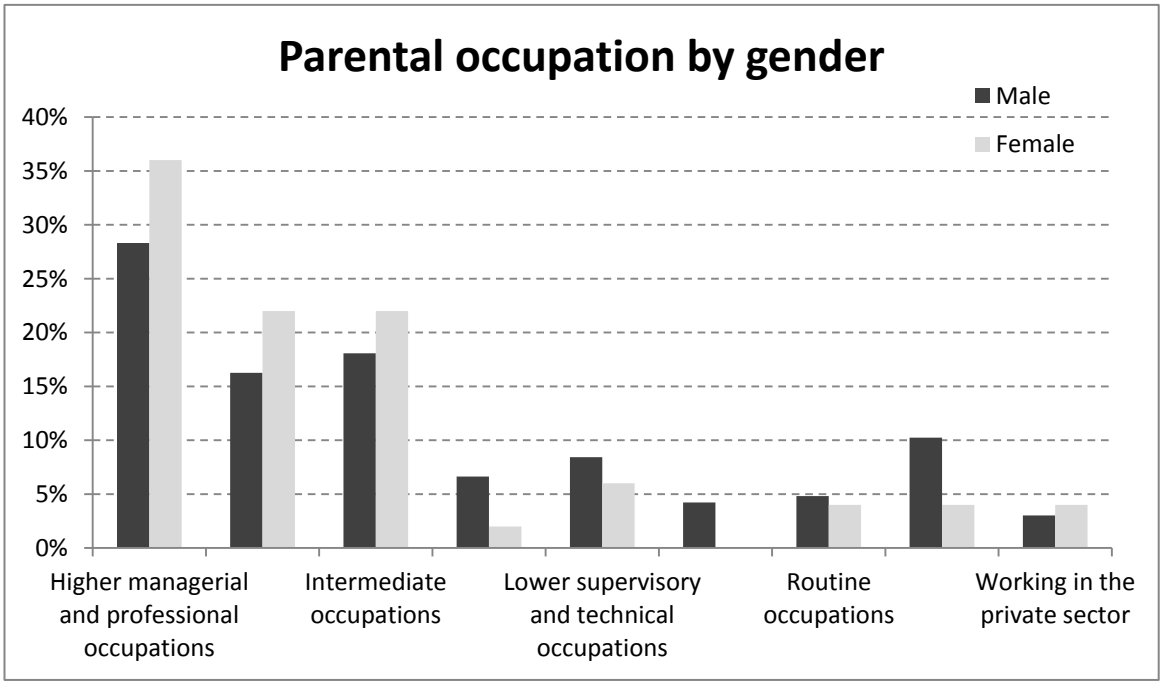
[121] GSRT (2008) showed that most graduates pursue doctoral studies within the same area as their first degree.

applied engineering. A few respondents in this study have undertaken a similar disciplinary transition which is explored further in the qualitative analysis of this study.

Parental and partner's socioeconomic status

Figure 4-3 shows the parental social class background of PhD graduate respondents assessed by the occupation of the father. It shows clearly as discussed by Gouvias (1998), that access to Greek higher education is favoured for students from higher socio-economic backgrounds.

Figure 4-2 Parental occupation of survey respondents by gender



Taking into account other studies beyond Greece that looked at the relationship between social class and participation in higher education (Ferri et al., 2003; Metcalfe 1997), it becomes evident this is not a surprising finding. Most PhD graduates come from *'higher social group'* if the classification of

Connor and Dewson is used (2001)[122]. On the basis of a large scale survey of German PhD graduates, Enders (2002) reported that parental socio-economic background played a significant role in accessing doctoral studies but did not appear to have an effect on the career development and employment situation after the PhD. A European wide survey of PhD researchers undertaken by the European Council of Doctoral Candidates and Junior Researchers (EURODOC, 2011) reported that the majority of PhD researchers in 12 European countries have parents with higher education qualifications[123].

Considering the partner's occupation of the respondents, it appears that over 80% of female respondents had a partner from higher managerial and professional occupations while the respective percentage for male respondents did not exceed 50%. The evidence that Greece remains a patriarchal society is indicated by research on national cultures (Hofstede, 2001) where Greece scores highly (57) in Masculinity Index occupying 18-19th position among 53 countries. High scores in the Masculinity index imply a patriarchal society where gender stereotypes persist and affect access and opportunities (Kantaraki et al., 2008; Zahou and Stafilas, 2008; Deligianni – Koumtzi et al., 2000[124]) despite equal opportunity policies enshrined in legislation (Kalerante and Kalafoti, 2008)[125].

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[122] According to Connor and Dewson (2001, p.3) professional, intermediate and skilled non manual belong to the 'higher social class group' while skilled manual, partly skilled and unskilled to the 'lower social class group'.

[123] The proportion of doctoral researchers with high parental educational background varied across countries, ranging from 45% of the sample in Finland to 69% of the Dutch sample (EURODOC, 2011).

[124] Deligianni-Koumtzi, V., Sakka, V., Psalti, A., Frosi, L., Arkoumani, S., Stogiannidou, A., Sigolitou, E., Gender Identities and Life Choices, Final Report, Thessaloniki, Aristotle

Age group of respondents, duration of PhD and age at the time of PhD completion

Nearly 80% of respondents fell within two age groups (see Appendix IV): 31-35 years old (45%) and 36-40 years old (35%). Comparing the two subsamples by country of doctoral education, the foreign-educated sample was younger than the domicile educated at the time of the survey (70% versus 44% fell respectively within 31-35 years old). However, it is more important to examine the age of the survey participants at the time of the PhD completion to understand differences between these two subsamples.

Table 4.5 Age group at the time of PhD completion

	Frequency	Valid %
Less than 25 years old	2	0.9
26-30 years old	114	49.1
31-35 years old	80	34.5
36-40 years old	17	7.3
41-50 years old	15	6.5
Over 50 years old	4	1.7
Total	**232**	**100.0**

The average age at the time of PhD award of study participants was 30-31 years old. About 84% of this study's respondents reported that they had completed their PhD before they were 35 years old which is reinforced by

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University of Thessaloniki, 2000. This research has looked at teenagers (students in lower and upper secondary education) and their perceptions about education and workplace. They found that traditional perceptions about gender still dominate the Greek society affecting largely the choices of men and women in education and employment. More specifically, they found for example than men were identified with positive sciences and were still perceived as the breadwinner of the household while women were linked to theoretical sciences and were considered to have the role of the mother/housewife.

[125] There are equal opportunities between men and women stipulated under the article 4, of the Greek Constitution 1. All Greeks are equal before the law; and 2. Greek men and women have equal rights and equal obligations'. (http://www.hri.org/MFA/syntagma/artcl25.html)

findings from the Greek study on the register of Greek PhD graduates (GSRT, 2008)[126].

The average age of PhD graduates varies from country to country. According to an OECD survey on doctorate holders in 2006 in seven different countries, the average age – in the European countries addressed in the study – German and Swiss PhD graduates were on average 32-33 years old, while Portuguese doctorate holders were 37-38 years old (Auriol, 2007). These different age patterns might reflect the differences in national higher education systems. Auriol mentions that possible explanations on this could be drawn by

> *"different factors affecting the organisation of higher education at national level: structure of programmes, public or private funding of institutions, access to doctoral fellowships/ scholarships, dependency on loans, or the need to work to finance one's studies" (ibid, p.11).*

According to HESA, 67% of Greek PhD graduates from UK universities (S&E population statistics 2002-2007/08) were 26-30 years old followed by 31-35 years old (23%). The GSRT study matching this study's criteria was dominated by individuals aged 31-35 years old (45.9%) followed by respondents aged 36-40 years (37.5%).

[126] According to GSRT findings, 85% of the respondents graduated from their PhD before they reach their 35 years.

Table 4.6 Age group at the time of PhD completion by country of PhD education

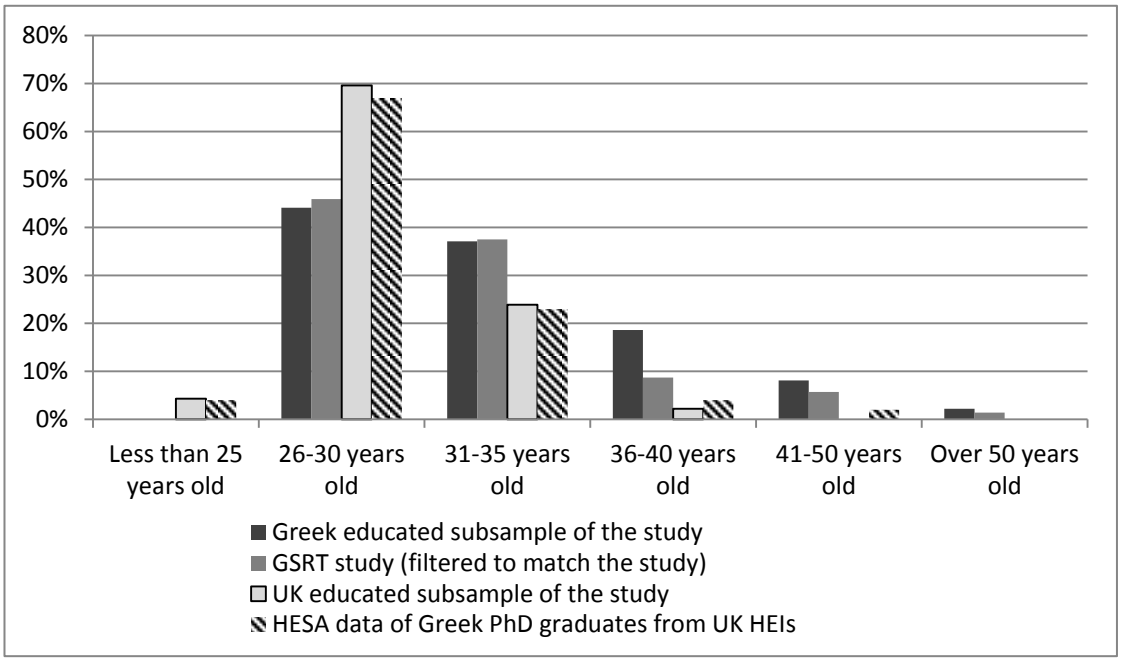
	PhD education in Greece (% within educated in GR)	GSRT study (filtered to match the study)[127]	PhD education in the UK (% within educated in UK)	Population of Greek PhD graduates from UK HEIs[128]
Age group (years)				
< 25	0	0	2 (4.3%)	4%
26-30	82 (44.1%)	45.9%	32 (69.6%)	67%
31-35	69 (37.1%)	37.5%	11 (23.9%)	23%
36-40	16 (8.6%)	8.7%	1 (2.2%)	4%
41-50	15 (8.1%)	5.7%	0	2%
> 50	4 (2.2%)	1.4%	0	0

Comparing the Greek-educated and foreign-educated subsamples of the study with that of the GSRT study (large scale survey for Greek-educated) and the HESA data (population data for Greek PhD graduates from UK universities), indicates to some extent that the study sample resembles the age characteristics of larger scale survey/population data.

[127] Access to the GSRT primary data was provided and thus it was possible to filter the data relevant to this study. Although the GSRT study is not based on a representative sample, there was large number of responses from Greek PhD graduates in natural science and engineering subjects during 2002-2008 (887 cases out of which 188 doctorates were awarded by foreign institutions and 699 by Greek universities). According to the 699 available cases of the GSRT study which had the same characteristics as the Greek-educated sample of this survey and I grouped the data into the same age groups of PhD completion.

[128] This information was drawn from HESA data and refers to the population of UK-educated Greek PhD graduates with a PhD in natural sciences and engineering awarded during 2002-2008.

Figure 4-3 Age at PhD award of survey respondents (by country of education) compared to larger datasets



The results indicate that foreign-educated Greek PhD graduates completed their doctoral studies at a younger age than their counterparts with PhDs from Greek universities. Of course duration of the PhD and age at the time of PhD are closely linked since the former affects the latter.

The Greek and UK higher education systems differ substantially[129], not least due to duration of the academic degrees as outlined in previous chapter (Table 3.11) .The average length of higher education degrees differs between Greece and UK with latter conferring academic qualifications of shorter duration. Thus, students complete higher education and enter the respective labour market at

[129] A comparison of the doctoral education systems in Greece and UK is provided in chapter three.

an older age than their counterparts in the UK if a linear progression of higher education degrees is followed.

Table 4.7 PhD duration of survey respondents

	Frequency	Percent
3 years or less	9	3.7
More than 3 years up to 4 years	59	24.2
More than 4 years, up to 5 years	68	27.9
More than 5 years, up to 6 years	54	22.1
Over 6 years	54	22.1
Total	244	100.0

In this study, more than half of the sample respondents completed their PhD within 5 years. However, doctoral study was more prolonged for 44% of the study participants.

Table 4.8 PhD duration of survey by country of doctoral education

	Greece	UK	Total
3 years or less	3.6%	4%	3.7%
More than 3 years up to 4 years	20.6%	38.0%	24.2%
More than 4 years, up to 5 years	26.8%	32.0%	27.9%
More than 5 years, up to 6 years	22.7%	20.0%	22.1%
Over 6 years	26.3%	6.0%	22.1%

When comparing the PhD duration of the survey respondents in Greek and UK universities it is clear that completing a doctoral degree in Greek took longer than in the UK. Only a fifth of the respondents with Greek doctoral degrees completed their PhD between 3-4 years while most foreign-educated

respondents completed their doctorate in UK universities in 4-5 years or 5-6 years.

Greek Universities: institutions where respondents completed their PhD

Table 4.9 shows that the majority of domicile educated respondents who were included in this project had studied their PhD within two Greek universities: the National Technical University of Athens and the Aristotle University of Thessaloniki. The National Technical University of Athens (NTUA) is the oldest and largest technical university in Greece with mainly engineering schools and many inter-departmental programmes with other universities or research institutes in Athens. NTUA is one of the most prestigious universities in Greece and it has been traditionally linked with good employment prospects (see Gouvias, 1998). Aristotle University is a multi-faculty university (including engineering and positive science schools) and also one of the oldest universities in Greece.

Table 4.9 PhD institution: Greek-educated survey respondents

Greek Universities	Frequency	%
National Technical University of Athens	86	44.3
Aristotle University of Thessaloniki	55	28.4
University of Patras	19	9.8
University of Crete	19	9.8
National and Kapodistrian University of Athens	8	4.1
University of Ioannina	5	2.6
Technical University of Crete	2	1.0
Total	**194**	**100.0**

The high status and size of these universities might explain the big participation from these schools. However, the small participation from the National and Kapodistrian University of Athens which is the oldest and one of the largest – as a multi-faculty institution – in Greece might be explained by the fact that there was a limited number of PhD graduates' contact information from this university in the register of doctorate holders in the National Documentation Centre[130]. Aristotle University in Thessaloniki and National Kapodistrian university of Athens are big metropolitan universities in Greece.

In addition these two universities along with the National Kapodistrian University of Athens, the University of Patras, University of Ioannina and University of Crete are the largest universities in terms of expenditures in R&D. (ERAWATCH 2010 based on unpublished data of GSRT).[131] It might consequently be expected that their PhD graduates will be at the forefront of innovative activities and highly sought after in both academia and industry more widely in Greece.

[130] As it has been noted before, in the methodology chapter, although PhD graduates are obliged to submit a copy of their PhD thesis and their contact information to the secretariat of their university department which will then sent it to NRC, staff at NRC mentioned that it is up to the discretion and the commitment of the department secretariat to this obligation. This is also evidenced by the fact that the register includes about 75-80% of all doctoral theses. It was also mentioned that some secretariats are waiting to have a number of theses before they sent them through to NRC.

[131] According to Web of Science of Reuters Thompson, these universities present high shares in publications especially in the natural sciences and engineering (Logotech, 2009). More specifically, the National Kapodistrian University of Athens has a share – in comparison to other universities in Greece- in publications of 21% followed by Aristotle University with 16.8%, Patras with 9.8%, National Technical University of Athens, with 9.2 and University of Crete with 7.1%.

UK Universities: institutions where respondents completed their PhD

The small number of respondents who completed a PhD in UK universities did not provide a representative picture but are indicative of the range of universities approached for help in identifying respondents and are comparable to the Greek HEIs sampled, in that the overwhelming majority have been frequent beneficiaries of the Engineering and Physical Sciences Research Council (ESPRC)[132]. This reflects to some extent the preference of Greek PhD researchers for top UK research intensive HEIs. According to HESA data, the institutions listed in the table below account for almost 55% of the total population of Greek PhD graduates in natural sciences and engineering in the period under examination[133]. The access and completion of doctorates in such prestigious UK institutions also suggest that the majority of Greeks were quite successful in securing doctoral posts in competitive higher education environments showing their high ability and potential.

[132] As it is outlined in the website, EPSRC is currently providing doctoral training grants or has established doctoral training centres in most of the institutions included in the sample. For more info please see: http://www.epsrc.ac.uk/funding/students/centres/Pages/byuni.aspx, last accessed 20/10/2011 and http://www.epsrc.ac.uk/funding/students/dta/Pages/grants.aspx , last accessed 20/10/20011.

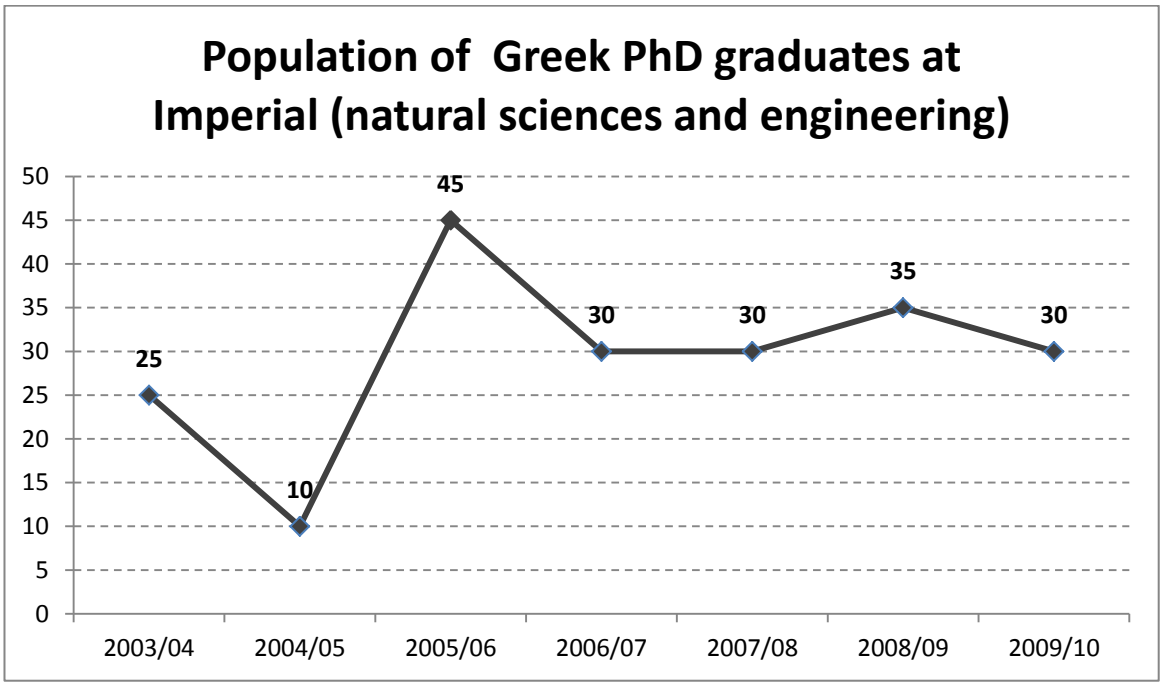
[133] According to HESA data, these institutions account for 47% of total population of Greek doctoral holders from UK universities in all disciplines in the period examined.

Table 4.10 PhD institution: UK-educated survey respondents

UK Universities	Frequency	%
Imperial College	15	30.0
University of Birmingham	5	10.0
King's college	4	8.0
University of Sheffield	4	8.0
University of Manchester	3	6.0
University of Surrey	3	6.0
University of Bristol	2	4.0
University of Cambridge	1	2.0
University of Lancaster	1	2.0
University of Leicester	1	2.0
University of Loughborough	1	2.0
Manchester Metropolitan University	1	2.0
University of Bradford	1	2.0
University of Newcastle	1	2.0
University of St Andrews	1	2.0
University of Stirling	1	2.0
University of Strathclyde	1	2.0
University of Sussex	1	2.0
Queen Mary	1	2.0
University College London	1	2.0
Other	1	2.0
Total	**50**	**100.0**
System	**194**	
	244	

Almost one third of the respondents were found to have completed a PhD at Imperial College which was the most frequent answer in the sample. The numbers in the table below shows that Imperial is the UK is preferred by Greek students in natural sciences and engineering doctoral studies according to HESA statistics during the period of 2002-2010.

Figure 4-4 Population of Greek PhD graduates at Imperial



Source: HESA (rounded)

Overall, there have been 300 students in the last 8 years of which around 230 completed a PhD in natural sciences and engineering at Imperial (this is about approximately one fifth of the total population of PhD graduates in these subjects according to HESA).The most popular subject areas that Greek PhD graduates pursue at doctoral level at Imperial are engineering (constituting almost half of the total number), physical sciences and biological sciences.

To sum up the survey respondents of this study were mainly male with a doctorate from a Greek institution. A smaller proportion of UK-educated PhD graduates participated due to the challenges presented earlier. However, study participants presented a similar distribution in terms of age and gender of Greek-educated (GSRT, 2008) and UK-educated (HESA). In addition, it is indicated that Greek domicile educated were more likely to prolong their doctoral studies and complete their PhD at a later age. On the contrary, UK-

educated were less likely to prolong their doctoral studies and thus they were awarded the PhD at a younger age – due to differences in the HE systems and the organisation of doctoral education in Greece and UK – and they were mainly educated in prestigious research intensive UK universities.

4.5 Interviews

Semi structured interviews were conducted with two different groups: the PhD graduates and employers of PhD graduates. This type of interview was employed as the most appropriate technique to obtain individual insights of both PhD graduates on career development after the PhD and of employers regarding the benefits of a PhD in the workplace (Silverman, 2000).

4.5.1 Interviews with doctoral graduates

The survey results formed the basis for issues to be followed-up with semi-structured interviews. Where there were obvious response biases (e.g. under-representation of sub-disciplines) that were taken into account at the qualitative stage. Matched interviews with doctoral graduates from Greek and UK-educated samples were undertaken with the aim to gather insights on the questionnaire data and examine further perceptions and issues arising from the survey. The objective was not only to obtain subjective accounts from doctoral graduates, but also to look more closely at their experience of doctoral education and the link with the labour market. In addition, through the interviews it was possible to identify issues that affect the supply of doctoral graduates and obstruct or facilitate the effective integration to employment, utilisation of knowledge and skills and the contribution of these highly skilled individuals.

Design of interview guides

Interview schedules were developed for PhD graduates to address the research questions of this study and the survey results. In addition, previous studies of PhD graduates that had used interviews to collect data were consulted (Souter, 2005; McCarthy and Simm, 2006; Purcell and Elias, 2006). The interview guide consisted a series of open thematic questions, which allowed for further exploration of the experiences of doctoral education and the subsequent career path of PhD graduates.

The semi-structured interviews covered similar themes to those investigated in the online survey, plus followed up questionnaire responses. Key survey responses provided by the members of the interview subsample informed each interview guide importantly ensuring that questions were relevant, but also showing that the interviewer was interested and knowledgeable of their career path to date. This was found to be effective in establishing and building rapport with the interviewee. In this way, particular issues were further investigated some of the 'how' and 'why' questions that could be asked enriched and elucidated the career path and doctoral education information provided in the survey responses.

Pilot interviews

Three pilot interviews with Greek PhD graduates with similar characteristics of the study population were undertaken early in the study to test the interview guide. All had completed a questionnaire in advance and were asked for feedback at the end of the interview. The pilot interviews helped to ensure that the questions were clear and comprehensive and that there was a good flow in

the structure of the interview. The semi-structured nature of the interviews, which were recorded for later transcription, allowed for adaptation of questions and ordering, where appropriate. Use of open-ended questions, with non-directive probes where required, ensured that respondents had the opportunity to elaborate on issues and use their own words to describe their decisions at situations[134].

Selection of respondents

In the questionnaire, the recipients were asked whether they would be willing to answer some supplementary questions and provided email or telephone contact information. The respondent who replied positively and provided contact information formed the pool from which interviewees were selected.

Selection of doctoral graduates and the number to be interviewed as representative of significant subgroups were determined on the basis of the initial analysis of the survey, but also on basis of employment sector (academic, public, private, self –employed), educational background (Greek – UK-educated) and discipline specific (Biology, Electrical Engineering, Physics and Computer Science).

After the selection of potential interviewees, each was contacted by telephone and email to participate in a follow-up interview within the next few weeks. Interviewees were also asked to send their curriculum vitae in advance of the

134 Working simultaneously at a RCUK project for UK PhD graduates of a similar cohort, complemented the researcher's work on questionnaires about PhD grads, developing interview guides and acquiring interview experience by conducting 10 interviews within the context of this project. In addition the researcher undertook training on 'in depth interviewing' which was useful preparation for this stage.

interview, as these provided a useful additional source of data to tailor questions in the interviews to the situations of the responses concerned. The information from the curriculum vitae and the questionnaire responses were inserted into the interview guide where appropriate to help the interviewer conduct the interview.

Data collection

Twenty-seven interviews (see table 4.11) undertaken by telephone were recorded with the consent by the interviewees, on assuring their anonymity conforming to well research ethics and data protection legislation[135]. The interviews lasted between one-two hours.

After each interview, a file was constructed for each interviewee with the following information: the questionnaire responses; the CV; the individualised interview guide; notes from the interviewer; and the recorded interview. All interviews were then transcribed. The interviewing process was undertaken in Greek and only a few were translated to English due to limited time[136]. NVivo, a qualitative software package, was used to support the analysis of the interview data.

[135] These ethics were in accordance with guidelines of the Institute for Employment Research.
[136] Selected key passages were translated to English for inclusion in this thesis.

Table 4.11 Characteristics of PhD graduates interviewed in this study

ID	Gender	Age_group (years)	Age at PhD completion	Discipline/subject area of PhD degree
phduk1	F	31-35	26-30	Electrochemistry
phduk2	M	31-35	26-30	Electrical Engineering
phduk3	M	31-35	< 25	Molecular Neuroscience
phduk4	F	31-35	26-30	Biophysics
phduk5	M	31-35	26-30	Microbiology
phduk6	M	36-40	31-35	Electrical Engineering
phduk7	F	31-35	26-30	Plant Biology
phduk8	M	36-40	31-35	Electrical Engineering
phduk9	F	31-35	26-30	Biology
phduk10	M	31-35	26-30	Neuroscience
phdgr1	M	36-40	31-35	Chemical engineering
phdgr2	M	36-40	31-35	Biomedical engineering
phdgr3	M	36-40	26-30	Computer and electrical engineering
phdgr4	F	36-40	26-30	Biomedical engineering and biophysics
phdgr5	F	31-35	26-30	Electrical and computer Engineering
phdgr6	F	36-40	26-30	Computer and electrical engineering
phdgr7	M	41-50	36-40	Electrical and computer Engineering
phdgr8	M	36-40	31-35	Physics - microelectronics
phdgr9	M	36-40	31-35	Electrical and computer Engineering
phdgr10	M	36-40	31-35	Chemical engineering
phdgr11	M	31-35	26-30	Electrical and computer Engineering
phdgr12	M	> 50	41-50	Biology
phdgr13	M	41-50	31-35	Electrical and computer Engineering
phdgr14	M	31-35	26-30	Microelectronics
phdgr15	F	36-40	31-35	Molecular biology and genetics
phdgr16	M	31-35	26-30	Computer and electrical engineering
phdgr17	F	41-50	31-35	Electrical Engineering

4.5.2 CV analysis of doctoral graduates

As previously reported, a small database of curriculum vitae and personal webpages was developed. These CVs were mainly used as a supplementary source of information, for which there is an established tradition in career studies (Gomez-Mejia and Balkin, 1992; Long et al., 1993). On the basis of CV analysis, Dietz et al. (2000) have looked at career paths of scientists and engineers. They conclude that there is great potential in using CVs as data for career trajectories of scientists and engineers but this instrument entails both advantages and disadvantages. In terms of benefits, the CVs are characterised by a '*richness'* in the data they provide about careers and they are *"easily obtained and* standardised" (ibid, p.421). As the authors put it:

> *"The CV, unlike other data sources, often recounts the entire career of the scholar in some detail. Thus it is not simply a list of credential, but a historical document that evolves over times capturing changes in interests, jobs and collaborations" (p.420).*

However, CVs are similarly subjective accounts of information about careers as the interviews and questionnaires. In addition, scientists and engineers might have different versions of CVs for different purposes such as academic promotion, consulting services, research funding (Dietz et al., 2000). Last, the online search for CVs.

> *"entail considerable selection effects since there is no reason to believe that the persons with readily available web based CVs are representative of the entire population of scientists and engineers" (Dietz et al., 2000; p.437-438).*

Fifty-eight CVs were collected from web searches during the retrieval process of contact information. At the same time, 27 CVs of interviewees that participated in the online survey and follow-up interviews were also added to

this CV databank. These 85 CVs were analysed in order to identify any patterns in the career paths of the PhD graduates.

4.5.3 Interviews with Employers

A small sample of employers in the UK and Greece consisting of a small number of senior public sector academics and managers mainly from the private sector, were interviewed. Again pilot interviews were carried out; which informed the interview approach to be taken with the Greek employers[137] of doctoral graduates outside the academic sector. While the academic sector has traditionally been considered as the 'destined' workplace for PhD graduates, and employers such as universities and research institutes for science and engineering PhD workforce could easily be identified, identifying non-academic sector employers was not easy. Some employers in this study did not participate because they did not regard it relevant to them or the intermediaries (HR representatives) were not able to acknowledge or understand the importance of PhD graduates in the workplace, as highlighted in previous research (Jackson, 2007; Souter, 2005). It was evident that some HR representatives did not have experience of recruiting PhD graduates and were not able to comment on specific benefits of this workforce. On reflection, it was considered important for future research to include supervisors or line-managers in R&D or respective departments that seek doctorate holders.

[137] UK employers are more engaged into activities linking university research and business than Greek employers. Thus, it is proposed to interview UK employers first.

Pilot interviews

Two interviews with UK employers[138] were undertaken as pilot interviews. Both were identified in a university PhD careers' fair. The respondents encountered were subsequently interviewed by phone and the interviews were recorded to allow for later assessment of how far the questions had worked as open, simple and comprehensive. It was considered that it would be useful to pilot the interview schedule with UK employers since previous research indicated that they were more likely to have sophisticated human resource management departments and procedures than their Greek counterparts. While the interviews were initially used as a test to refine the interview schedule, they were also included in the dataset because they proved to work effectively and provided some useful comparable perspectives on the doctoral labour market to those given by the Greek employers.

Selection of respondents

Identifying both UK and Greek employers outside academia posed challenges since there is no readily available information on employers who are interested in recruiting PhD graduates. The selection of employers was done on criteria such as: high R&D activity; high R&D expenditure; specific targeting of PhDs and industrial classification[139] where possible in order to acquire a diverse picture of different industries (please see tables 4-12, 4-13 below).

[138] One employer was in manufacturing sector (semiconductors industry) and the other belonged in the services sector (actuaries).

[139] The employers did not have to fit all the criteria. It was very difficult to identify companies that were specifically targeting PhDs because there is no readily available information on this issue. However, through the questionnaire and the interviews with PhD graduates, information

The initial approach adopted was to explore which companies focused on R&D activities that may have provided employment opportunities for members of this highly skilled workforce. This kind of information was provided by the EU industrial scoreboard[140] which outlined European companies investing heavily in R&D information allowing for a comparative approach in UK and Greek companies. Inspecting the EU Industrial R&D Investment Scoreboards of 2006, 2007, 2008 Greece (as an EU country) had a very small number of companies being included within this Scoreboard.

The UK has hitherto been the leading European country with the most R&D intensive companies (headquarters) within its boundaries. The number of UK R&D companies across the previous three years ranged from 327(2006) to 321(2007) to 289 (2008) covering a wide range of sectors[141].

A random selection was undertaken within the scoreboard to cover as many employment sectors as possible related to science and engineering. Formal letters with request to undertake a brief interview were sent to 20 UK companies and eight in Greece[142].

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on employers were disclosed which was used to identify further employers. In two cases, interviews were undertaken with both the employer and the PhD graduate employee.

[140] The EU Industrial scoreboard include the 1000 EU companies which invest the largest sums in R&D in the last reporting year e.g. the 2006 EU scoreboard includes the data for the year 2005/06.

[141] Pharmaceuticals and biotechnology remaining the biggest sources for inward R&D investment, according to the UK trade and investment agency (for more see http://www.ukinvest.gov.uk/UKTI-publications/4046342/en-GB.html).

[142] Telephone contact was pursued before sending the letters to identify the HR representative of the company and address the letter to him/her. Thus, telephone enquiries and research over

In addition, a more informal approach was adopted with the UK employers. The careers service at the University of Warwick organised career fairs for Warwick students and graduates. Attendance at a PhD employers' networking event and in a science and engineering fair enabled PhD recruitment and perceptions on this issue to be researched and gathered. At the same time, there was an opportunity to establish contact and pursue a telephone interview.

In Greece, employers were followed up by telephone conversation to arrange a meeting either by telephone and where possible, face-to-face. It was extremely difficult to persuade employers and managers to participate. The economic crisis in Greece during the data collection phase did not facilitate in engaging company representatives.

Finally, six interviews from four companies included in the R&D scoreboard were undertaken with Greek employers. In addition, four additional interviews were conducted with HR representatives of companies with a good R&D reputation and/or specific targeting of PhDs in the Greek market.

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the internet were undertaken to fulfil this challenging task. In addition, follow up was crucial in getting a few of them accepting the request.

Table 4.12 Characteristics of Greek employers-participants in this study

ID	Ownership of company	Personnel	Sector	Sector distribution	Type of company
E1	Greek	500-999	Defense electronics	Manufacturing	Multinational
E2	Foreign owned	1-49 (Branch)	Consulting	Services	Multinational
E3	44% Greek ownership,56% free float shareholding	1500+	Manufacturing of machinery and equipment	Manufacturing	Multinational
E4	Greek	1000-1499	Food technology	Manufacturing	Private company
E5	Greek	500-999	Pharmaceutical	Manufacturing	Private company
E6	51% Russian (foreign) 49% Greek	1500+	Telecommunications	Services	Multinational
E7	Greek	500-999	Pharmaceutical	Manufacturing	Private company
E8	Foreign owned	51-249	Pharmaceutical	Manufacturing	Multinational
E9	Greek	250 -499	Cosmetics	Manufacturing	Multinational

In terms of UK employers, the following interviews were undertaken: eight brief interviews within the venue of a PhD networking event at the University of Warwick and four in-depth telephone interviews. These were initially aimed at informing the interview approach with Greek employers and understand the main issues regarding recruitment of PhD graduates. While these employers were likely to be favourably biased towards PhD recruitment, they were considered appropriate because they were interested in the PhD labour market and had had experience with recruiting PhDs. The data collected fulfilled the initial aim. During the analysis, interesting differences were identified and informed the analysis of the data collection from the employers in Greece. A

detailed casebook of UK and Greek employers is included in Tables 4.13 and 4.14.

Table 4.13 Characteristics of UK employers participants in this study

ID	Ownership of company	Personnel	Sector distribution[143]	Type of company
EUK1	UK	1500+	Services	Multinational
EUK2	Foreign owned	1500+	Manufacturing	Multinational
EUK3	UK	250 -499	Services	Multinational
EUK4	UK	250 -499	Services	Multinational
EUK5	Foreign owned	1500+	Manufacturing	Multinational
EUK6	UK	250 -499	Manufacturing	Multinational
EUK7	UK	1 – 49	Manufacturing	Multinational
EUK8	UK	1500+	Manufacturing	Multinational
EUK9	UK	250 -499	Services	Public sector
EUK10	UK	500-999	Services	Private company
EUK11	UK	1500+	Manufacturing	Multinational
EUK12	Foreign owned	500-999	Manufacturing	Multinational

Design of interview guides

Interview guides were developed in English but were translated and slightly modified to take account of the Greek context. The guides were developed with reference to interview protocols employed in other studies (see Purcell and Elias, 2006; Souter, 2005) and aimed at investigating the experience and perceptions of employers relating to PhD recruitment. More specifically, the

[143] The sector classification of the companies that participated in the study was based on the NACE classification which has taken the acronym from the French name *"Nomenclature générale des Activités économiques dans les Communautés Européennes"* (Statistical classification of economic activities in the European Communities). NACE is a pan-European classification system which groups organisations according to their business activities. More information on the definition of NACE can be found in the website of European Commission: https://datacollection.jrc.ec.europa.eu/wordef/nace, last accessed 11/02/2012.

interviews explored to what extent employers took account of the particular skills and knowledge that a PhD graduate might have acquired, how they perceived the PhD in terms of its role in knowledge and skills development and more broadly, the benefits or the concerns that might entail for the non-academic sector, to what extent they were specifically targeting PhD graduates from natural sciences and engineering and the rationale behind this targeting (see Appendix II for the interview schedule). The interviews were transcribed and key selected passages were translated into English. They were imported, coded and analysed with the help of NVivo software.

Ethical issues

Since much of the data gathered was personal and related to 'sensitive' issues, it was of pivotal importance to guarantee anonymity to the participants in both the survey and the interviews. The invitation to participate in the research outlined ethical considerations to the participants who could refuse to participate and withdraw at any stage. Consent was obtained to record of all the interviews.

4.6 Bringing all the datasets together

The questionnaire data, the interviews, the CV analysis and available secondary data provide complementary evidence from different sources. The secondary data enabled the researcher to assess the extent to which the achieved survey sample was representative of the population for which it is drawn and its key characteristics. While documents were used as an 'assessment of representativeness' (Pole and Lampard, 2002, p.149) of the

interview data, the latter would be employed in such a way that would critically inform (incorporating critical comments from the interviewees, Hodder, 1998) the documentary analysis. Mason (2002) highlights the importance of using methodological 'triangulation'. Using different methods (questionnaire, interviews, statistics etc.) can draw attention to new aspects and issues and make the researcher more susceptible to different angles and perspectives (Mason, 2002). All forms of data contributed towards understanding the differences between theory and practice regarding the perceptions of doctorate and its holders by both PhD graduates and their employers.

4.7 Conclusions

The mixed methods research design for this study involved a number of different tools and instruments (online survey, interviews with two different groups, CV analysis) addressing two groups: the Greek PhD graduates (with the criteria defined); and employers of PhD graduates. This methodological design was adopted as the most appropriate for addressing the research questions of this study and collecting empirical data – both quantitative and qualitative – on a population that has been under-researched. Despite its advantages in terms of complementing different data sources and contextualising the information gathered, mixed methods research often entail challenges for the researcher such as time/resources required for data collection and requirement of specific skills (Creswell and Clark, 2011).

The methodology adopted for this study was more demanding and time-consuming than anticipated. A substantial amount of time was invested in the

collection of quantitative and qualitative data. In terms of quantitative data. various difficulties were encountered due to the lack of comprehensive directory of the targeted population and the challenge in identifying and contacting these potential respondents, overcoming language problems and continuous practical complications in the design and launch of the online survey. The preparation, conducting and analysis of interview data was also more time-consuming than anticipated.

The difficulty of undertaking social sciences' research in the Greek environment in terms of low level of participation and engagement has been confirmed in this study as in previous research concerning employers and universities. Finally, the major economic crisis that hit Greece in 2009 did not facilitate participation of Greek employers not least because recruitment of PhD graduates was not high priority during that period. Overall, the methodology adopted has enabled the collection of rich data.

Chapter 5 -DOCTORAL EDUCATION CHARACTERISTICS AND CAREER PATHS

5.1 Introduction

As indicated in Chapter two, careers are complex phenomena which are shaped by various determinants. This chapter aims to elucidate the motivation of the participants and the factors that influenced their decision-making process regarding the pursuit of a PhD. Through this process, the reasons about education-led migration of the UK-educated participants are explored, compared to those who stayed in Greece for their doctoral studies. Furthermore, the investigation covered the extent to which, and how, doctoral education characteristics such as motivation for the PhD, institutional choice, the relationship with the supervisor and the type of funding gained during the PhD appeared to influence subsequent career paths.

5.2 Decision to undertake a PhD

In terms of country of doctoral education, the decision making process for a PhD degree seemed to be different. In the UK, there was a clearly defined process in which individuals apply for a PhD. Being aware that funding is available in UK institutions, they would make a decision on the basis of availability of funding, reputation of the institution, interest in the subject area and supervisor, as it was confirmed by the UK-educated participants in this study.

In Greece, the process was found to be more informal and entailed approaching professors in the subject area of personal interest either before or

after the thesis of the first degree (often within the same institution where they undertook previous studies); expressing interest in their specialism and starting working with them. Compared to the UK, there was a limited number of institutions in Greece that confer doctoral degrees, so institutional choice was dependent on previous experience in the institution, funding, location and convenience.

The decision making process for undertaking a doctorate is complex and entails a number of issues to be considered including funding provisions, personal motivation, preferences, supervision and institutional characteristics which are presented in the following sections.

5.2.1 Motivation for studying for a PhD

Previous research (Purcell and Elias, 2006; Walkering, 2009; PRES, 2009) on postgraduate study has explored the motivation for embarking on such a commitment, identifying a range of reasons which have been classified as ‘intrinsic’ and ‘extrinsic’ using psychological concepts (see Deci and Ryan, 2002).

According to the survey results, most respondents embarked on doctoral education because they were interested in research (73%) or in the subject area (58%) itself, reflecting their intrinsic motivation. Doctoral education is about immersing oneself to a research topic for an extensive period of time so it is unsurprising that interest in a subject or research was the most likely motivation. After all, these reasons have been reported in large scale surveys of PhD candidates in the UK (Vitae, 2012; Hodsdon and Buckley, 2011).

From an extrinsic view, some perceived the PhD as an opportunity to generally improve their career prospects (41%) or the necessary 'passport' to enter the academic labour market (37%). Encouragement from professors and prospective supervisors was also indicated as a reason for undertaking a PhD by almost one fifth of respondents. No great differences were observed in terms of country of doctoral education and discipline[144].

Interestingly, five of the UK-educated interviewees in this study seemed to have 'drifted' (Bazeley, 1999) into further study due to favourable circumstances for a PhD. For two of these cases, the topic of interest was closer to a PhD rather than a MA (Uk4, Uk7). While the other three cases had no prior intention of pursuing doctoral education, they applied to study for a PhD because they were able to combine their studies with work experience in a private company, (Uk2, Uk6) and/or they secured funding for their fees (Uk6) and stipend (Uk1,Uk2).

The motivation for doctoral education seemed to be connected with the sector of current employment that study participants reported at the time of the survey, which is explored in section 6.3.2.

[144] There were some differences in the motivations according to disciplinary groups but due to the small size of subgroups they should be treated with caution. For example, only 11% of chemical science graduates followed by computer science and electrical engineering PhD graduates (35%, 37%) reported that they would do the PhD to pursue an academic career while around 2 out of 3 PhD graduates in physical and biological sciences would indicate as one of the reasons. In contrast, the latter would be least likely to indicate the improvement of career prospects in general (20-25%) whereby one in two of PhD graduates in chemical sciences, electrical engineering and computer science would have selected this as a reason.

5.2.2 Funding during doctoral studies

Funding plays a significant role in doctoral education shaping educational, mobility and sometimes career choices. The most frequently indicated funding sources were scholarships, employment related to research and self-funding. More than half of the respondents with a PhD from UK universities funded their studies through a sole funding stream, often with scholarships, whereas their counterparts in Greek universities were more likely to combine different sources of funding (Table 5.1).

Scholarships were the main funding stream underlining its primary role as a funding source for undertaking a doctorate in the UK[145]. This might also reinforce the implication that foreign-educated PhD graduates were more likely to have been successful in securing doctoral studentships in highly prestigious institutions as a result of having high grades/achievement in their prior educational experience.

Greek-educated respondents appeared more frequently to have been self-funding and reliant on family financial support for their PhD than was the case for the foreign-educated. This suggests to some extent the lack of PhD funded opportunities in Greek universities and the low level of scholarships available

[145]Comparing the survey results of UK-educated with the Greek-educated – despite the limited sample of UK-educated participants – twice as many UK-educated respondents reported the award of funded scholarship as one of the reasons for undertaking a PhD. According to the results, 3.1% (n=6) of Greek-educated and 24.5% (n=12) indicated as a reason for pursuing a PhD being awarded a funded scholarship. According to HEFCE (2009) on trends and profiles of PhD study, most full time PhD students pursuing a doctorate are supported financially for their tuition fees by the Research Councils, the UK institutions, charities, industry and UK and international funding bodies. The percentage of starter PhDs with no financial backing has been quite low (15-20%) remaining at the same levels in 1996-97, 2000-2001 and 2004-2005.

in Greek universities as noted in chapter three (see Karamessini, 2004; Galanaki, 2002)..

Table 5.1 Funding sources of doctoral education

Funding sources during doctoral education	PhD education in Greece %	PhD education in UK %	Total % (%within country of PhD education)
Scholarships	18.2	54.0	25.6
Employment related to subject area of my research	17.2	4.0	14.5
Employment related to subject area of my research and self-funding	16.7	4.0	14.0
Scholarship and employment related to subject area of my research	11.5	16.0	12.4
Employment (related and not related to subject area of my research)	6.8	0	5.4
Employment not related to subject area of my research and self-funding	6.8	4.0	6.2
Scholarship and self-funding	6.3	8.0	6.6
Other	4.7	6.0	5.0
Self-funded	3.1	0	2.5
Support from employer/industry	2.1	2.0	2.1
Employment not related to subject area of my research	1.6	0	1.2
Scholarship and employer support	1.0	2.0	1.2
Scholarship and employment not related to subject area of my research	1.0	0	.8
Employment related to subject area of my research and support from employer	1.0	0	.8
Support from employer and employment not related to subject area of my research	1.0	0	.8
Support from employer and self-funding	1.0	0	.8
Total	**100.0**	**100.0**	**100.0**

The lack of tuition fees for doctoral studies in Greek institutions is accompanied by limited funding opportunities for doctoral ‘stipends’. In the past decade, an increasing number of PhD studentships in Greek institutions have been dependent on the availability of EU-funded programmes such as HERAKLITOS and PENEDGreek-educated PhD graduates in this study were more likely to fund their doctorate through their participation in EU programmes that were granted to their supervisor or their lab/research group. These programmes have enhanced the number of PhD candidates and graduates in Greek institutions and have enhanced to some extent the attractiveness of scientific careers in Greece as one interviewee reported:

> *“EU programmes helped a lot, people got paid, thus there was an incentive to stay here and despite the difficulties and the lack of organisation and infrastructure – there is no comparison between the institutions abroad – there were though incentives to stay and make an effort. Therefore, there was a new framework that was born or gave birth, let’s say, to the many doctoral candidates and PhD graduates subsequently, at least in the sense I have lived this situation at my institution.”*

[gr5, female, electrical and computer engineering (biomedical engineering), university researcher, Greece]

Nevertheless, they were criticised for directing academic research on EU rather than national priorities with implications reflected in the dependence of Greek academics on European funding and its potential effect on doctoral research:

> *“My supervisors during my postgraduate studies were in essence doing research on the basis of funding. So, they were being paid by EU to study for example x.., I did my Master’s degree in x. These projects concerned x,y so my supervisor, having had funding to undertake this research, was occupied with these problems. Therefore, in some way, if you wanted to cooperate with this supervisor, you would be occupied in research terms with problems that he was looking at, defined by funding. Thus, the funding of your supervisor influences you, and influenced my research directly or indirectly.”*

[gr16, male, computer engineering and informatics, postdoc, UK]

Apart from being a source to support themselves, this funding was beneficial in other terms such as developing project management skills including budget allocation, time management or building contacts/networks with partners in HEIs around Europe or professionals in companies. This experience is significant in assisting early career researchers in strengthening their research record, enhancing their generic skills and becoming a valuable member of the research group/lab. Thus, it was unsurprising to find that many Greek-educated participants in this study, who worked in European projects during their doctoral studies were more likely to carry on working in academia often in the same lab or department where they completed their doctorate.

Scholarship/self-funding versus employment outside academia

One third of survey respondents indicated that they were self-funded or supported by their family during their doctoral studies. A Greek-educated interviewee completed his doctoral education with a Greek scholarship and self-funding, raising the importance of this support:

> *"I managed to undertake quality studies because of the financial comfort provided by my family, that bought me a small flat and I did not have to pay rent. I had the scholarship but also my father would give me extra money, when it was required. Therefore, I never had to work on something different that could distract me and this concentration allowed me eventually to get a very good post in a US university. Otherwise, it would not be possible, however smart you are.."*
>
> *Interviewer: "Did you see this compared to other students?"*
>
> *"I saw it in other students who had the same potential as me but did not have a similar development. It is very important, to be focused on the subject and not having to do other things. In this way, I did not have to work at all in irrelevant research programmes of professors that might distract me."*

[Gr3, computer engineering and informatics, research staff member, Switzerland]

Similarly, another interviewee highlighted his supervisor's emphasis on concentration on the PhD through preventing him from teaching or any activity in parallel to his doctoral studies. He recalled specifically:

> *"For my supervisor teaching was not an option. In general, he did not want to distract my attention to something else because my PhD was quite difficult. From time to time, I was thinking of doing something simultaneously, but he didn't let me. He was telling me, I will give you more money but you won't do anything else concurrently with the PhD."*

[Gr11, electrical and computer engineering, postdoc, Switzerland]

Adequate funding was considered vital for concentration and high quality research leading to a postdoc in prestigious universities or research centres which further enhanced subsequent career development of PhD graduates as has been showed in other studies (Cameron and Blackburn, 1981). PhD candidates that had to support themselves through employment could endanger the quality of their PhD research leading to significant consequences such as less publications, poorer opportunities for postdoctoral posts, etc. This was confirmed by Greek-educated interviewees, who worked outside of the university during their doctoral studies. They reported experiencing a prolonged PhD degree, and feeling isolated from the rest of the doctoral community. The following interviewee explained how his decision to seek employment outside the university impacted in his career aspirations and choices:

> *"I saw that I could get more money outside academia than those I was earning from university, from participation in research projects. So I discussed it with my professor and in essence I stopped those completely and found a job […] I wanted to become an academic but I saw afterwards that it was more difficult from what I initially thought [...] Well, I was also late*

in submitting the PhD which was another issue. Normally, I should have finished in 1998/1999 not take 10 years but there was a family matter, and I had left it for some time. In essence, all the papers and the research I have done, were until 1997/1998, afterwards I didn't do anything.

I would have liked to get a university position, a research position, in the institute where I was studying. At the same time though, I started working outside the university, I was a bit cut off from the university, therefore it was a bit difficult afterwards to.. Many of my friends that started the PhD with me, stayed [in academia]. They also finished the PhD earlier than me and they stayed in the university. But because I started working and I was late in completing it, the opportunities in 2003 let's say, were not the same as in 1996-1997. […] if I had finished it in 1997, let's say, which was the optimum [completion time], the job opportunities and the vacancies were many more than what they are now, I think. Basically I was looking for lecturer positions because in essence, I would have liked to start climbing up the [academic] ladder, but this was not finally the case. And I saw that many people I knew who finished their PhD went through many hardships so I thought subsequently that my efforts would be meaningless. That the dream would not be fulfilled easily, therefore in essence I quit it.."

[Gr2, male, electrical and computer engineering, Senior IT consultant, Greece]

Similarly, other interviewees with an electrical engineering degree were working in the Greek labour market as engineers during their doctorate. Most remained in private sector employment. It could be argued that preoccupation with their work – as their main income source – prevented them from concentrating on their PhD, contributing to a delay in completion, a low number of publications, loss of networks and subsequently limited opportunities to get an academic post. These factors coupled with the difficulty in accessing a permanent job in Greek academia seem to have had an effect on the career aspirations of some, pushing them away from an academic career path.

Bazeley (1999) in a small study of PhD graduates in Australian universities found that employment during the PhD and duration of doctoral studies had an influence in the current employment two years after graduation. He reported in his study that PhD graduates who took longer than five years to complete were

less likely to be involved in research activities. In addition, he noted that individuals employed during the PhD were less likely to be employed in a research post after the doctorate, unless they were employed in a research position (ibid).

The majority of UK-educated participants had secured financial support before embarking on their doctoral studies. Many interviewees received scholarships from the UK Research Councils (i.e. the BBSRC and EPSRC due to the disciplinary groups examined in this study) – or an award from their doctoral education institution. Most followed academic paths. In contrast, PhD graduates funded by private companies in cooperation with universities[146] or by working outside the university were more likely to be found in private sector employment. This is in line with other studies that reported the high likelihood of PhD graduates with industrial doctoral funding to follow non-academic career paths (see Moguerou, 2002; Martinelli, 2002; Mangemantin, 2000).

In this section, interviewees in this study had raised issues such as choice of HEI, supervision and discipline in their accounts on funding provisions, demonstrating the close relationship of these doctoral education aspects and their combined influence on career development. These variables will be further explored next.

[146] Cases like this were only found amongst the UK-educated interviewees of this study.

5.2.3 Choice of higher education institution to pursue doctoral studies

The selection of HEI for doctoral studies was recognised to be complex since respondents indicated more than one reasons for their decision (Table 7.2). The most frequently and the most important reason reported for deciding on the HEIs was the course or combination of subject areas (42.5%), according to the survey results ('all reasons column', table 7.2). This was followed by reasons such as *"I particularly wanted to study at that institution*" (39.6%) and *"had studied/spent some time in the past"* (37.5%). Institution specific characteristics such as reputation and quality education were also reported as significant.

Connor and Dewson (2001) identified the course/subject as one of the two main factors – the other one being the financial issues – influencing institutional choice at undergraduate level. It seems that the importance of subject area extends beyond undergraduate education. Furthermore, considering the inherent narrow character of postgraduate education which requires independence, continuous focus and student commitment, the subject is becoming a critical parameter for HEI selection.

It was more likely for foreign-educated PhD graduates in the study to consider the international reputation of the institution, the course/combination of subjects and the quality of education as the most important reasons for their decision to pursue a doctorate.

Table 5.2 All reasons/the most important reason for selecting HEI institution for doctoral studies

What was the most important reason that you decided to undertake a PhD at the HEI institution that you studied?				
	Greece	**UK**	**Total**	**All reasons for HEI selection (% of cases)**
Found exactly the course/comb of subjects I wanted to study	36 (18.6%)	9 (18%)	**45**	102 (42.5%)
Combination of reasons (not indicated most important)	30 (15.5%)	2 (4%)	**32**	
Wanted the best quality education in my area of study	11 (5.7%)	8 (16%)	**19**	59 (24.6%)
Particularly wanted to study at that institution	25 (12.9%)	3 (6%)	**28**	95 (39.6%)
Other	21 (10.8%)	6 (12%)	**27**	26 (10.8%)
Had studied/spent some time in the past	18 (9.3%)	3 (6%)	**21**	90 (37.5%)
Wanted to study in institution with international reputation in my area of study	9 (4.6%)	10 (20%)	**19**	68 (28.3%)
Better job prospects in the Greek labour market	19 (9.8%)	0	**19**	63 (26.3%)
Logistics easier	16 (8.2%)	1 (2%)	**17**	49 (20.4%)
Better job prospects in the global labour market	4 (2.1%)	2 (4%)	**6**	32 (13.3%)
Wanted to get the best provisions in research experience in my area of study	2 (1%)	0	**2**	41 (17.1%)
Experience foreign academic communities	2 (1%)	4 (8%)	**6**	14 (5.8%)
Preferred course not available in Greece	1 (0.5%)	1 (2%)	**2**	9 (3.8%)
Total (N=243)	**194**	**49**	**243**	

Uk3, applied to three reputable universities and decided to undertake his doctorate at the university which combined the following features of doctoral education, and not the most prestigious one:

"Well, it is important in the PhD.. One part is the university, in general how recognisable it is, but more importantly, is the supervisor you are working with and your project. Although the specific university was not the best university but my group and my supervisor was quite established in her sector. It had the infrastructure and I got very good training from this group which was my aim, to get from the PhD all the credentials I needed from an educational aspect in order to use them later whatever I choose to do."

[uk3, male, biological sciences, postdoc, UK]

This example highlights further differences between undergraduate and doctoral education. The prestige of the institution has been found to affect positively labour market outcomes of undergraduates (Black and Smith, 2006; Chevalier, 2009; Hussain et al., 2009) and PhD graduates who followed academic paths (Reskin 1979; Baldi 1995; Burris, 2004). However, in the case of doctoral education, more importance is attributed to the research group prestige (individual professors/ supervisors, research groups) rather than institutional prestige. As Fox (2001, p.661) has reported *'the decentralisation and privatisation of graduate education is particularly strong in science'* underlining the significance of supervisor relationship rather than the departmental/university context. As emphasised in the example (uk3), the supervisor's reputation and the quality of the research group were significant considerations for institutional choice and were retrospectively vital for the doctoral training provided and the subsequent career of PhD holders.

PhD graduates from Greek universities ascribed similar importance to the course/combination of subjects for their PhD but additional factors were underlined in their decision to pursue a PhD in a Greek institution. Logistics and previous degree experience played a significant role in their decisions since the transition was smoother for those remaining in the same region or within Greece. Therefore, the importance of proximity to their home or

workplace (overlapping with career/funding/work related issues) or personal bonding with their hometown was reported in the online survey: '*I was not determined to go abroad, I had bonds with the city'* and *' I wanted to study in the city from which I am coming from'.* These participants had selected regional institutions to undertake their doctoral studies and they remained in the same regions to work. Apart from the strong cultural character of Greek institutions, most had stayed in the same institution for their higher education studies – minimum duration of 9 years – developing a social life and professional network. Location was also important for those working during the PhD who wanted to have easy access to the workplace and the university, pursuing often studies in Athens based institutions to exploit the wide range of labour market opportunities. Lack of funding also prevented participants – with low socioeconomic background based on the occupational data of their parents – from studying abroad or limited their institutional choice e.g. *'there was no financial possibility to study abroad (USA) as I would have liked to'* or *'I wanted to be close to my family for financial reasons' 'without funding, it was impossible to do something equivalent somewhere else'.* Instead they pursued their doctoral studies in the same institutions where they completed their previous degree which provided scholarships or research assistance.

Only a small number of Greek-educated participants – often with a PhD in engineering– reported that they chose to study in a Greek institution because this would have provided better prospects in the Greek labour market. This was not indicated by any foreign-educated counterparts.

While staying in Greece for doctoral studies facilitates building professional and academic networks, it could be argued that a PhD from a prestigious university in the UK might also open employment doors for doctoral graduates (Karamessini, 2004) as used to be the case in the 1970-80s (Gavroglou, 1981)[147]. Nevertheless, this has recently changed with the expansion of Greek higher education, the establishment of postgraduate degrees and the high production of domestically educated PhD graduates. A Greek-educated interviewee (Gr5) described how the domestic postgraduate education system has improved decreasing the importance of foreign educational or professional experience:

> *"We are able now to compete with those who went abroad, although we stayed here (in Greece) and we did not go for a postdoc abroad. We have equally good publications in good journals. In the past, we might not have been able to compete, but not anymore […] In the past, we would see people who came from very reputable US universities with awe. Because they did better quality research than we did. This might still be the case but we are definitely in a better position."*

[gr5, female, electrical and computer engineering (biomedical engineering), university researcher, Greece]

Partly due to the increased output and sometimes quality of doctoral programmes and the limited academic opportunities, it became clear – through the interviews – that foreign-educated PhDs found it difficult to access permanent academic posts in Greece (see chapter six). Surprisingly, the

[147] More than 70% of professorial or senior academic posts were occupied by Greek academics with postgraduate education or academic experience in a reputable foreign university. This was explained by the limited capacity of Greek universities to produce PhD graduates. According to a quote of the Minister of Education (Georgios Rallis Gavroglou) cited in Gavroglou (1981) (*Kathimerini*) in 1976: *'Among the approximately 200 professors and senior lecturers who have been appointed in the last two years, approximately 150 come from European and American universities, where they had equivalent positions or titles.'*

prestige of their university was appreciated in the private sector to some extent, as it is illustrated in the next case.

A female graduate (Uk4) in Physics from a Greek university wanted to go abroad to '*open her eyes'*. She came from a privileged socio-economic background so funding did not play a role in her educational choice. She rejected going to a top US university due to the long distance and the long duration of US PhD degrees. The UK, for her, seemed more favourable in both terms, so she applied to two prestigious universities (Russell Group universities) for different postgraduate degrees. Then, she chose to do a PhD in a prestigious London-based university rather than a Masters in Oxbridge on the basis of subject interest and love for experimental work. Her preference towards a more cosmopolitan city with a respected university also contributed favourably to her decision. Retrospectively, this resolution was beneficial not only for her subsequent career path since she got postdoctoral funding in her doctoral studies' institution but also the doctorate from a prestigious university were key to her current job. Her position required a PhD or MBA from a prestigious – mainly from abroad, UK or US – university.

> *"They didn't hire me because I was working previously at a research institute or I had a physics degree they hired me because I have done them quickly, I was 28-29 when I went and I had completed my PhD in a university with prestige in a positive science."*
>
> **[uk4, female, PhD in biological sciences, management consultant, Greece]**

Overall, UK-educated PhDs were more aspirational in their choices of doctoral education institutions considering the prestige, the academic quality of the supervisor and the department while Greek-educated raised often pragmatic

issues such as location, logistics and funding. The important role of the supervisor was reported by both groups and is further examined below.

5.2.4 Supervision

The relationship between supervisor and PhD candidate has been acknowledged as one of the critical points of doctoral experience in numerous studies (Bowen &Rudenstine, 1992; Lovitts, 2001; Green and Powel, 2007[148]). However, most research has focused on the effect of supervision on time to completion and doctoral attrition (Long, 1987; Lovitts, 2001; Golde, 2005, Picciano et al., 2008) while supervision's influence on career development of PhD graduates has been overlooked. Zhao et al. (2007) highlighted the importance of the supervision relationship not just in terms of doctoral education experience, but also 'beyond' doctoral study:

> *"The advising relationship not only affects the quality of the doctoral experience, there are also material implications. In many disciplines, funding for doctoral study and for dissertation research often comes directly from advisors and their grants. And the impact of the advising relationship can last far beyond the years of doctoral study. For example, the strength of an advisor's letter of recommendation can affect the career options open to a student. When asked for advice by new graduate students, savvy students focus on advisor attributes and strategies for selecting an advisor" (ibid, p.264-265).*

The survey respondents also reported the combination of topic and supervisor, as important issues for institutional selection, raising issues of inspiration, appreciation and quality of academics. Moreover, the supervisor was identified as key to enhanced career prospects or *"life after PhD"* as he/she mentioned:

[148]Zhao et al.(2007) have edited a book on the doctorate worldwide which provides an overview of doctoral programmes in a number of European countries, Australia, USA and Canada. This book also discusses the importance of supervisor in doctoral education in these countries.

> *"I knew that the supervisors with whom I have cooperated, had many contacts with research centres and industries abroad which were my main goal after the completion of my research".*

In the interviews with both Greek and UK-educated PhD graduates the role of the supervisor was evident in encouraging them to pursue a doctorate, providing financial support through different means (awards, research or teaching assistance) but also facilitating their transition to the labour market. Supervisors were able to use their own career experience and contacts affecting to some extent the career choices of their mentees. In addition, as highlighted in section 5.2.2, supervisors could indirectly influence subsequent career development through 'protecting' PhD graduates from distracting activities and ensuring the quality of their research.

UK-educated PhD graduates were more likely to emphasise the role of their supervisor in encouraging and providing financial support before they embark on doctoral education. The significance of the supervisor was further extended for those who remained abroad working in the academic sector as presented in the following case.Uk5 was awarded his doctoral thesis and gained funding to do a postdoc in the same institution where he completed his PhD. He recalled in relation to his first job:

> *"my supervisor told me to complete this postdoc, return to Greece to do my military service, and then I would be able to return to him without any problem."*

Thus, Uk5 had a smooth transition from the PhD to his first job and his subsequent career choices with the advice and support of his supervisor. During his military service, he carried on cooperating with his research group

and supervising students working on his on-going project. A few months after his military service and his return to the UK, he accepted a postdoc offer from an American collaborator. As he said, it was the '*next logical step'* in his career, influenced also by his supervisor:

> *"It was the natural progression. When I had started my PhD, my supervisor had told me 'at some point you would have to go to US if you want to follow the path you are interested in'. We have a nickname for this, we call it BTA = Been to America, something like a qualification. You have to do it otherwise there is no great career progression. Therefore, I knew that at some point I would have to do this. In one way or another I knew that I would return to London finally."*

[Uk5, male, biological sciences, public sector, General Manager, UK].

His PhD supervisor had followed a similar route so he was able to support him through this experience. After his postdoc in the US, Uk5 completed another postdoc alongside his supervisor before moving to the public sector where the PhD and his US experience were both required. It was evident that his mentor provided valuable careers advice, advising him how to manage his career and informing him about discipline specific career information that might not be accessible to outsiders.

However, negative experiences were also reported which operated as push factors from specific career orientations. A few interviewees stated feeling demotivated or disappointed by academic practices pushing them away from an academic career path: e.g. priorities/interests of supervisors in conflict to doctoral completion or publication of results.

Uk2 recalled that his supervisor delayed the completion of his PhD. Although he had collected his data in three years, his supervisor prioritised students

without funding. This was the general policy of the department. Although his first draft was ready in six months, his submission and viva were severely delayed leading to his disappointment:

> *"The last one and a half was very demotivating because, I felt like I lost time. While theoretically I could have stayed a bit more in academia like an academic but […] and potentially to have stayed there. But this slowly demotivated me and I told myself, I don't want to be like them."*

[uk2, male, computer and electrical engineering, product manager, Greece]

Similarly, Uk4 had a disappointing experience with her doctoral supervisor during her postdoc. Her supervisor prevented her from publishing research results due to fear of conflict with an established academic with whom they cooperated. . This experience along with personal reasons led her to return to Greece. This altered her opinion about academia and perceptions of working in the sector:

> *"It was a matter of politics, this is how the system works. And when you are a bit innocent, you are thinking, how nice is academia but it is not. It has many many politics and in order to get funding you need to know people. And then in order to publish, you also need to know people, the editors in big magazines otherwise your paper is not accepted. And then you wonder, why?"*

[Uk4, female, biological and physical sciences, management consultant, Greece]

Conversely, the Greek-educated acknowledged the key role of the supervisor in providing a topic for the doctorate and securing financial support for doctoral candidates through EU programmes. More importantly, Greek-educated interviewees were more likely to report that they had remained in the same institution where they completed their doctoral studies working with their supervisor and research group after the PhD. When they were asked about their transition to their first post PhD job, they commented that *'it was a natural*

progression', they just had a discussion and agreed with the supervisor about continuing on working on the same or similar research projects. All the Greek-educated interviewees working in the Greek academic sector at the time of the survey had a similar experience. After their PhD, they worked with their supervisors as self-employed researchers – on project-based contracts – providing research services to projects. As one noted, her first job after the PhD:

> *"I think it came as a natural progression, there was no vacancy procurement. There was the project, so 'would you like to undertake this? Yes, I do. Would you like to do the other? Yes, I do', this is how it worked"*
>
> **[Gr4, female, electrical and computer engineering, researcher, Greece]**

The duration of this post-PhD collaboration varied between the different interviewees although there was a tendency to continue working under temporary teaching or research posts in the university even after 5-6 years of their PhD unless they found a more permanent post in another institution. Two interviewees in this study after working 6-7 years as self-employed in the same group were successful in getting a researcher post becoming an 'official' employee of the university.

The Greek-educated interviewees working abroad at the time of the survey also provided evidence that linked their supervisors with their career choices especially in relation to choosing postdoctoral institution and a 'supervisor'. The following example provided by a Greek-educated PhD graduate emphasised the most – amongst the interviewees – the vital role of his supervisor in many aspects of his doctoral experience. Firstly, he was inspired by the subject area his supervisor taught and he was determined to study this further. Although he considered going abroad and had offers from US

universities, he decided to remain in the institution where he completed his undergraduate degree because of his supervisor:

> *"I was very happy where I was at the time, I had my own house, I liked the place, I was doing good research, I was taking very much time from my professor, he was spending much time with me so I didn't leave, if I were to stay in Greece [for my PhD], it would only be there, with my professor the only reason that I stayed in Greece was him [...] You would open books and you would see his name in the references, he was not somebody unknown, I knew that references count a lot towards the research importance of an academic. He had also come from one of the best universities in the world so said I to myself, I want to study with him, I don't have to go abroad, I will do good studies here."*

His goal was to do as good research as possible with a view to getting a postdoc at a reputable university in the US and work next to established academics in his field, who were also introduced by his supervisor:

> *"When I was on my third year of my PhD, my supervisor gave me to read a book on x systems. This book was written by somebody called Y, a famous name in the US. I was determined to work next to him.. and I did it."*

[Gr3, computer engineering and informatics, research staff, multinational, Switzerland]

Unsurprisingly, the influence of supervisors was less significant on career development of PhD graduates who chose to work outside academia during or after their doctorate.

It is evident that supervisors perform diverse roles in doctoral education, which have implications for the future career and life of their PhD candidates. Zelditch (1990, p.11)[149] had summarised successfully the multiple roles of a mentor: advisors, supporters, tutors, masters, sponsors, models.

[149] "Mentors are advisors, people with career experience willing to share their knowledge; supporters, people who give emotional and moral encouragement; tutors, people who give

Interviewees in this study have referred to these roles through their accounts highlighting the significant role of PhD supervisors alongside other factors already highlighted. However, contextual factors beyond individual control might have a greater bearing on the career choices of PhD graduates as chapter eight will show.

5.3 Conclusions

This chapter has presented evidence on the decisions of PhD graduates in relation to their doctoral education and in turn how these choices influenced their career choices after the PhD. The decision-making process for embarking on a PhD was different between the two countries in terms of availability of information.

Many participants in this study did not perceive the PhD primarily as instrumental to solving their employment problem, deciding to embark on a PhD due to their intrinsic desire to spend a considerable amount of time pursuing exploration of a subject they were passionate, enthusiastic or 'romantic' about. In chapter six, the motivation in relation to the current employment is explored to identify the extent of this relationship.

Through examining the decision-making process of participants for doctoral education, it was evident that issues related to funding, supervision, HEI

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specific feedback on one's performance; masters, in the sense of employers to whom one is apprenticed; sponsors, sources of information about and aid in obtaining opportunities; models, of identity, of the kind of person one should be to be an academic"

choice and motivation interacted with each other and provided insights into the push and pull factors of education-led migration decisions (in relation to doctoral studies) for the UK-educated. Thus, while limited funding and lack of infrastructure in Greece might account as push factors to pursue a doctorate in the UK, it was more likely that UK-educated were 'pulled' into such decision. Most of them were attracted by the international reputation, the quality of education and the availability of funding in prestigious institutions. In addition, previous study experience in the UK coupled with encouragement and financial support from supervisors motivated prospective PhD graduates to remain in the UK. The smaller duration of doctoral degrees in the UK was also an important factor for mobility especially amongst the female participants of this study.

In contrast, Greek-educated participants chose to remain in Greece often due to 'favourable conditions' for their doctoral studies such as a supervisor that they admired, previous experience of the institution (there is limited institutional mobility of students) and availability of working at EU programmes for financial support. Pragmatic and personal considerations such as proximity to home, workplace – for those combining studies with non-academic employment – or family and friends were important reasons to stay in Greece The significance of funding was highlighted by the participants facilitating not only a smooth doctoral education process but also the production of desired outcomes in the form of good quality research, publications and subsequent employment opportunities affecting career choices. Sufficient funding was related to the

timely completion and high quality research since it enabled PhD candidates to fully immerse on a topic.

According to participants' accounts, it becomes clear that different types of funding can affect PhD graduates' careers in various ways. UK-educated participants with scholarships awarded from RCUK or doctoral education institutions were often found in academic paths after the PhD.

EU funding was a primary source of funding for the Greek-educated in this study who were more likely to have a smooth transition to postdoc/research posts – continuing working in EU projects – and follow academic paths often within the same institutions where they completed their doctorates. Through this experience, they developed further research and project management skills and had built networks and contacts with project collaborators. This professional experience was helpful for their CV, as well as for cementing their position in the research lab or team, as evidenced in their retrospective accounts. However, they were also more likely to orient their research according to the availability of funding in a subject area that was not chosen by them. In contrast, PhD graduates who funded their doctoral studies through working outside the university – often as engineers – were found in non-academic career paths, progressing to senior technical or managerial posts in the Greek private and public sector.

Similarly to UK-educated respondents, funding also played a role but often took the form of participating in European research programmes rather than individual scholarships. The significance of funding was demonstrated not only

through its effect on shaping the subject area/topic of doctorate but also through triggering mobility at disciplinary, institutional and geographical level. Participants provided examples of institutional financial support, reflecting the correlation between funding and HEI.

The supervisor was also found to be critical for the choice of HEI, the quality of doctoral education training and the career choices of the PhD graduates. The supervisor performed various roles for the participants in this study that were a catalyst for their subsequent employment and life choices. These roles ranged from initially encouraging them to pursue a doctorate and secure funding, to advising them on career management and utilisation of personal and professional networks to ensure that their mentees would meet their potential. For those educated in Greece, remaining in a Greek institution for doctoral studies enabled them to build useful networks with the academic staff and a good relationship with the supervisor. Both elements were vital for a smooth transition – like a 'natural progression' – into postdocs and temporary research posts as well as contributing to the future election of PhD graduates as academic staff members.

More information about the early career paths of participants considering country of doctoral study is provided in the next chapter.

Chapter 6 CAREER PATHS OF PHD GRADUATES

6.1 Introduction

This chapter focuses on the early career paths of Greek PhD graduates drawing on different data sources (namely the survey, interviews and CV analysis) in order to provide an understanding of their career building experience. A typical career path in Greek academia is outlined while the effect of country of doctoral study is examined, considering the possible career paths – including inter-sectoral mobility decisions –that Greek and UK-educated participants followed in this study. Next, the current employment of survey respondents is investigated looking at the different job characteristics for PhD graduates working in the academic and non-academic sectors. Differences are noted between these two sectors in terms of contractual arrangements, earnings and means to access employment while a principal component analysis is used to identify the relative importance of aspects of employment that make PhD graduates satisfied with their current job. Throughout the chapter, subsamples are compared to evaluate the significance of employment sector and location, plus investigate the differences and similarities in the doctoral labour market within and beyond academia in the UK and Greece.

6.2 Early career paths of PhD graduates: initial employment activities

According to the online survey data, respondents comprise: those who were continuously engaged in the same activity since the PhD completion until the time of the survey, and those who had changed activity during that period.

Table 6.1 provides a brief overview of the characteristics of the former group showing that nearly two thirds of the respondents had been engaged in their current employment activity since the completion of their PhD. The majority of this group was located in the academic sector (almost 70%) and this reflects the high incidence of respondents who continue working in the same higher education or research institute after completing their doctorate. A high proportion (85%) of this group was satisfied, or very satisfied[150], with the relevance of doctoral education to their current employment and was using, their detailed PhD knowledge.

Table 6.1 Profile of the respondents engaged in the same activity since completing their PhD

(N=158)	**Number of responses**	**Percentage (%)**
	Gender	
Male	126	79.7
Female	32	20.3
	PhD education	
Educated in Greece	129	81.6
Educated in UK	29	18.4
	Current employment	
Permanent/open ended	73	49.0
Fixed term lasting more than 12 months	36	24.2
Fixed term lasting less than 12 months	12	8.1
Project based contract	15	10.1
Self employed	13	8.7
	Sector of current employment	
Academic	105	68.6
Public/state	21	13.7
Private	27	17.6
	Country of current employment	
Greece	106	67.1-74.1
Abroad	37	23.4-25.9
	Importance of PhD	
Formal requirement	78	49.4-53.1
Important	40	25.3-27.2
Not very important but helped	15	9.5-10.2
Not important	13	8.2-8.8

[150] More information about career and job satisfaction is presented later in this chapter.

6.2.1 Not engaged in the same activity: First/second activity in the online survey

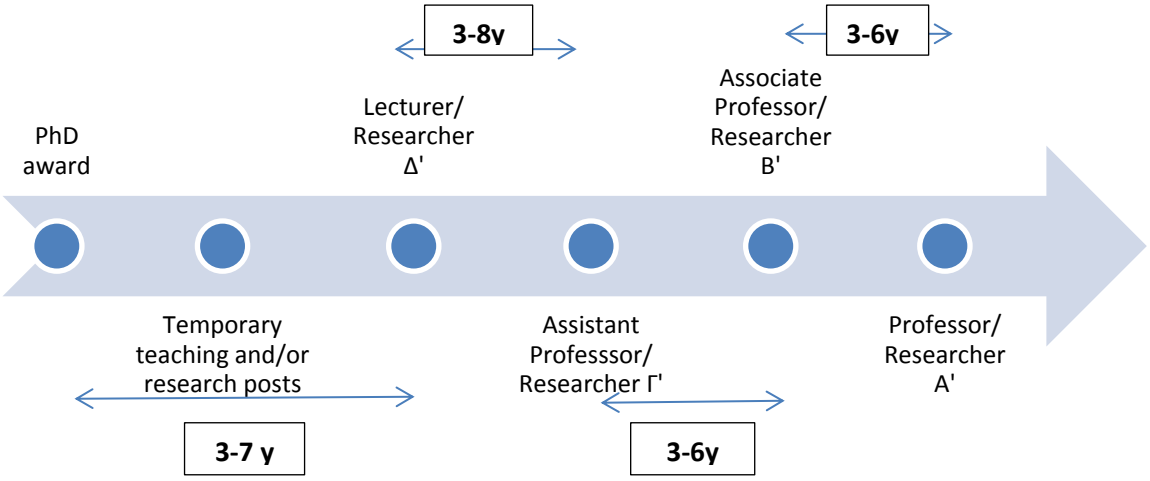
Given the well-established incidence of temporary research posts(Robin and Cahuzak, 2003[151]; Gaughan and Robin, 2004; Bazeley, 1999), or 'holding positions' [152], it was concluded that collection of full time data was likely to be time consuming and subject to respondent error in precise recall. Instead of collecting detailed information of respondents' current activities, survey participants were asked to report their first activity after graduation and their most recent activity. In the majority of the cases, significant transitions between sectors and unusual career progression were not observed. Most of the respondents carried on undertaking similar activities to improve their career options and broaden their experience.

Karamessini (2004) identified three progression routes for academic careers in Greece outlining the importance of temporary posts as necessary steps in the proposed trajectories. Considering these types, the legislative frameworks for academic and research staff in Greece and the data from this study, a typical career path in the Greek academic labour market would look like figure 6-1:

[151] Robin and Cahuzak looked at the temporary posts that French PhD graduates (life sciences) undertake in their pursuit of an academic career.

[152] Kehm (2006) in her comparative analysis of doctoral education in Europe and North America mentions explicitly regarding the difficulties of transition of PhD graduates into academic careers: '*there is talk of 'overproduction' of doctoral degree holders resulting in a wide variety of post-doctoral fellowships and in-between positions characterized as 'holding positions' where post docs stay in a waiting loop until proper employment is found. This does not only prolong the time until the beginning of a proper career, it also adds an additional layer of uncertainty to the life-planning of young academics. Seen from a perspective of return on investment and productivity this situation is not very viable.' (Kehm, 2006,p.72)*

Figure 6-1 Typical career path of Greek PhD graduates in the Greek academic labour market



According to the 85 respondents in this study who were not engaged in the same activity, their first activity after the PhD was a temporary teaching or research post or they often combined such posts in the institutions where they completed their doctorate and /or institutions of less prestige in the wider area (PD/407, teaching in TEIs/military schools/post-secondary education colleges scientific associate, research associates, postdocs).They were then slowly progressing to less temporary academic or research posts.

Evidence from the CV analysis and the interviews showed that PhD graduates often reported more than one activity especially during the first years after their doctorate, while similar patterns are found in other countries (Auriol, 2010). As a positive consequence, individuals are able to enhance the professional experience required in order to be eligible for a tenure-track post and their professional and personal networks within and beyond the institution of their doctoral education. They also develop skills and broaden their labour market opportunities while increasing their relatively low income. On the negative side,

such early career patterns reflect precarious, insecure and stressful employment.

The respondents in academic paths tended to slowly progress to less temporary posts and sometimes tenure track posts. It appeared that respondents working in Greek academia took three to seven years to gain a lectureship. After entering the first academic rank, legislation defines the period of 'service' in this grade before applying for appointment to the next and the years required for re-applying in case of a negative decision[153]. Tenure-track posts, such as equivalent ranks in TEIs or peripheral universities were reported to have taken less time than in prestigious universities in metropolitan areas. In addition, the evidence from the CV analysis and the online survey data showed that in the long-term, PhD graduates appeared to have had to decide whether to remain in a temporary post at the university where they had undertaken their PhD (prestigious and big universities in metropolitan areas) or pursue jobs in institutions with lower status and size where it appeared to be potentially easier to access less temporary employment. Although it was not possible in this study, it would be useful for further research to explore whether this is a common phenomenon and whether the latter graduates subsequently return to the university where they undertook their PhD studies or find it difficult to do so.

[153] For more see Section 3.4.4, pp.118-119. This explains the long duration between different ranks. For example, in the case of a PhD graduate getting a position of assistant professor, he/she has a term of service of three years after which he/she is obliged to apply for tenure.

6.2.2 Career paths by country of doctoral education

The following figures 6-2 and 6-3 represent the paths of PhD graduates in this study considering the country of their doctoral education and current employment. They depict alternative career paths to the typical path represented in figure 6-1. Both Greek and foreign-educated returnees seem to be equally likely to access short-term, temporary teaching and research posts as a necessary step in their career progression. However, there is less likelihood of UK-educated gaining tenure-track posts in Greece compared to the domicile educated participants. In contrast, many of those working abroad in academia, were more likely to be in postdoctoral positions with a fixed-term contract of more than one year, or a lectureship contract varying from one to four years.

Figure 6-2 Possible career paths of Greek-educated participants

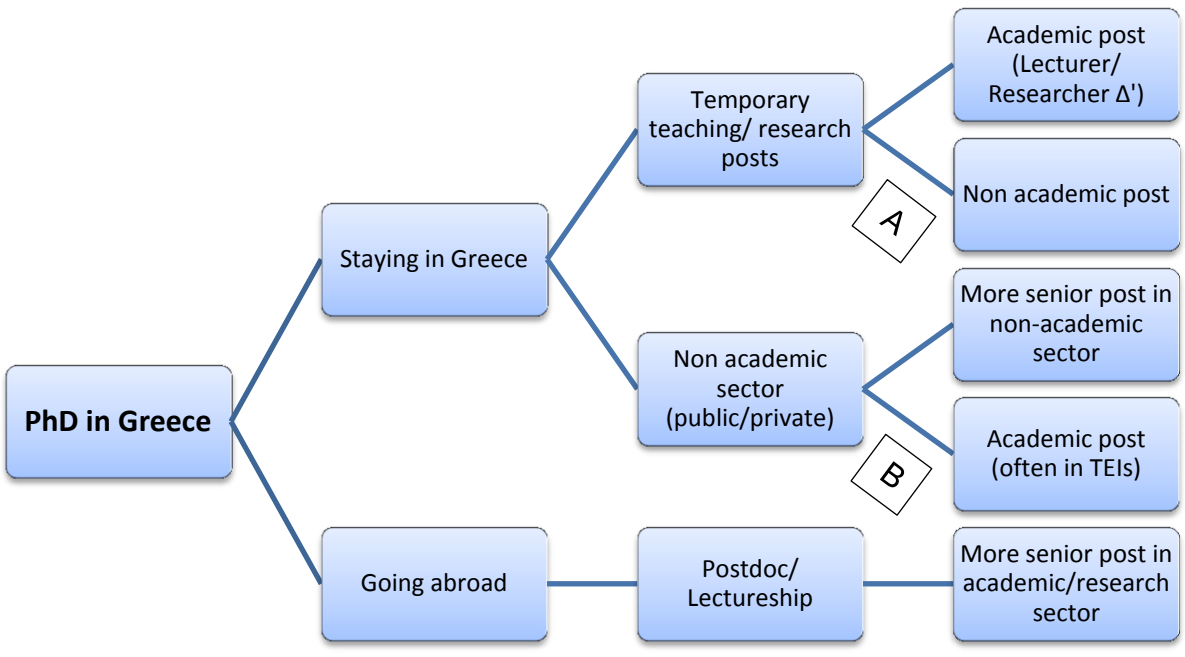
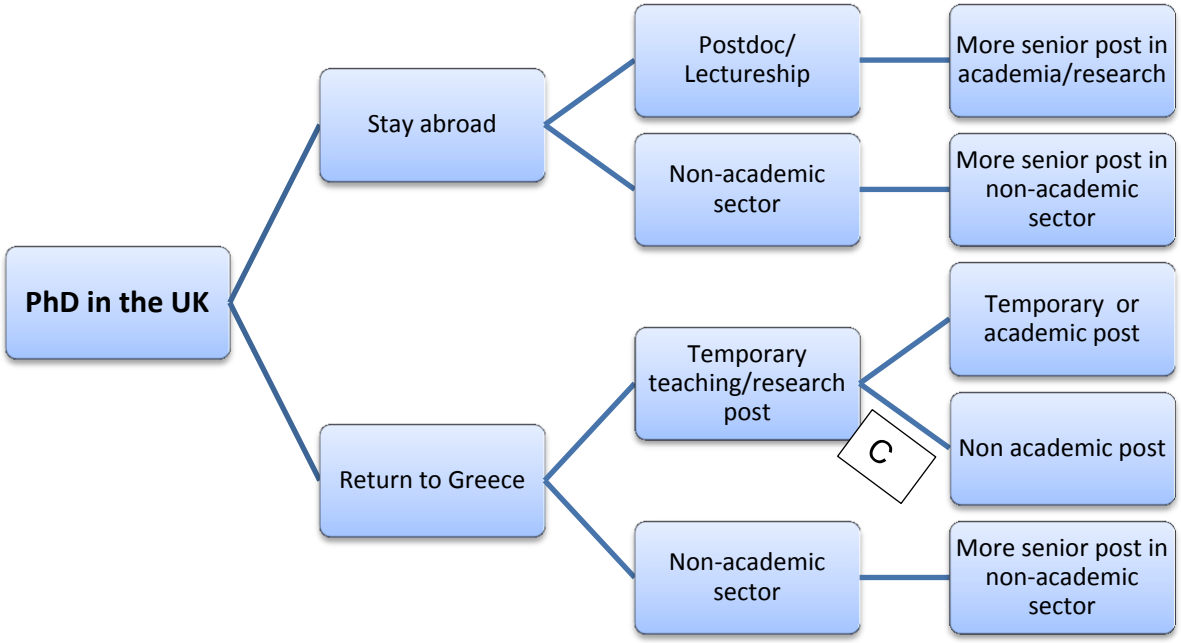


Figure 6-3 Possible career paths of UK-educated participants



Outside academia, most of the participants working in the private sector after their PhD appeared to remain in the private sector progressing to more senior positions. A small proportion of the Greek PhD participants indicated that they had mainly undertaken jobs in multinational and private companies in Greece. These cases were more likely to work under permanent/open-ended contracts and fixed-term contracts lasting more than a year. PhD graduates from engineering subjects dominated this group, working either full-time or as self-employed occupying positions such as: technical consultant; multimedia product engineer; project engineer; project consultant; technology engineer; network engineer and programmer. The choice of non-academic sector is linked to the high employability of those with engineering and biological sciences degrees in the Greek labour market and beyond (see chapter eight).

In addition, PhD graduates in engineering were most likely to combine academic and non-academic activities during and after their PhD. Somewhat less so, PhD holders in biological sciences reported following a similar route, combining postdocs or temporary teaching activity with working at pharmaceutical companies and the general health sector. Biological sciences' academic departments required research expertise and conducted similar research to researchers in the pharmaceutical and medical industry, which was found to have a range of research job opportunities.

Greek educated: inter-sectoral mobility

Thus, Greek-educated respondents were mobile in both ways (see A and B in figure 6-2) between academic and non-academic sectors in the Greek labour market. Respondents who moved from a non-academic (first) activity to an academic current employment (B) reported that it was for career reasons. It was more frequently indicated in the survey that this decision was defined by career reasons and preferences towards specific jobs and sectors: '*it fitted my career plans', 'to gain experience to get the job I really wanted', 'I wanted to improve career options', 'I wanted to work in the specific sector' and 'it was exactly the type of work I wanted'*. For example, participants with a first employment activity in the public sector (either as secondary education teacher or engineer position in local authorities and public sector posts) moved to posts in HEIs as teaching staff (lab associate, professor of applications, senior lecturer in TEIs).

Conversely, those who moved from academia (in their first job) to non-academic employment (A) indicated practical reasons such as *'to earn a living',*

'it was the only job offer I had', 'the salary was attractive' or to *'broaden experience and develop skills'*. This group was more likely to report satisfaction with their current employment in terms of salary and job security rather than intrinsic aspects such as PhD relevance where low scores were observed. Thus, it could be said that mobility to the non-academic sector for this group derived more from financial need and necessity to find employment rather than occupational choice.

The overwhelming majority of Greek-educated graduates that migrated abroad was predominantly employed in academic posts suggesting that their decision to undertake job mobility was triggered by career and scientific development reasons.

UK-educated: inter-sectoral mobility

The foreign-educated who remained abroad were found working both in academic and non-academic sector. Even those who changed activity – between the first and the current – had remained in the same sector of their first activity. The decision to remain abroad is explained by the high satisfaction of this group with current employment irrespective of employment sector. Even those in the non-academic sector were more satisfied with intrinsic and extrinsic aspects of their job in compared to their counterparts in Greece. The role of the PhD appeared to be perceived more favourably abroad, contributing significantly not only in terms of getting a job (formal requirement) but also in coping with everyday tasks that required using their PhD skills and knowledge. This indicates that labour market considerations and country of employment are more important than country of doctoral

education, since both Greek and foreign-educated working abroad reported a satisfactory working life.

Conversely, country of doctoral study seemed to affect negatively the academic employment of foreign-educated returning to Greece. The majority of these participants were found in temporary teaching/research positions, one to two years after their PhD completion, showing their initial preferences towards an academic career[154].This was reinforced as all indicated that these activities *'fitted their career plans'* or they were *'exactly the type of work they wanted'*. However, looking at the current employment sector, most respondents had moved to the non-academic sector. Only two participants were still following an academic path at the time of the survey undertaking temporary teaching posts in Greek universities which they found through personal and professional contacts. They reported undertaking this post not only for career related reasons but also for practical reasons (to earn a living, to stay in the area of my workplace, it was the only offer I got). They both expressed their dissatisfaction not only in terms of financial aspects of their career (salary, job security) but also with their career to date.

The majority of UK-educated returnees moved into private or public sector employment (C). The reasons reported in the survey varied from career related (fitted career plans, get experience and skills, gain experience to get the work I really wanted) to practical reasons (to earn a living, wanted to work in the region, see if I like the type of work involved). This group was more likely to

[154] It was not asked in the survey where this activity takes place so it is not known whether they undertook their first employment in the UK, in Greece or elsewhere.

report dissatisfaction with the relevance of their PhD to their current employment. The qualitative data provided an additional insight into these career choices. All foreign-educated returnees interviewed in this study were in non-academic employment. Although four cases explored the option of academic careers in Greece, worked in temporary research and teaching posts in Greece, they ended up working in the non-academic sector. The following case study illustrates the early career choices of foreign-educated PhD graduates who have returned to Greece, currently working in the non-academic sector. UK9 is female returnee in biological sciences moving to the non-academic sector (hospital). The limited opportunities of permanent positions and the increasing job insecurity were the main reasons to accept a position – that required an undergraduate degree – in a private hospital. While she did not use her specialised PhD knowledge in this job, she was able to get a temporary postdoc transfer within a hospital project due to her doctorate.

Case study: Uk9 (female, biological sciences, Greek private sector)

This PhD graduate in genetics returned to Greece and undertook a postdoc in a research institute in Greece working as self-employed with 3 months project based contracts. She highlighted the insecure working environment for biologists in Greece:

"Biologists in Greece work with project based contracts. My first contract was for three months, then it was renewed for another 3 months and then it was renewed for another 1,5 year, meaning that there was not permanent job. […] this is usually the situation under which biologists work in research centres in Greece, with project based contracts unless they work for a long time, for example after 8 years they could take a permanent post of researcher".

After a year, she got an offer from a biology hospital lab that she accepted. She decided to move from the research institute to the private sector for two reasons*:*

"The main reason was the job security. Secondly, it was not certain that my contract could be further renewed in the research institute I was working at the time, something that the professor had already announced to us. Therefore, I had to also consider this. I did not know if I would have the luxury to find work quickly and have the chance to see how things work in the private sector if I turned down this offer from the hospital".

Although her job required a first degree, the PhD enabled her later in this hospital to get involved in a two year research project where she works currently as a postdoctoral researcher while her initial job is waiting for her after the end of the project.

A similar case study is provided in section 7.3 (under-employed graduate) a male foreign-educated returnee who was not able to access a tenure track or permanent job in academia and compromised by taking a job in the public sector. While he acknowledged that his poor publications affected his 'academic' employability, he also identified structural obstacles in the Greek academic system due to his doctoral education abroad. He raised the issues of nepotism and politics of Greek academia that prevented to some extent, foreign-educated returnees to access the 'insider' group.

All the foreign-educated graduates raised similar concerns about the unfavourable terms and working conditions of employment in academia and the peculiarities of the Greek academic market (corruption, nepotism, political clientelism) during the interviews. Even those who remained in the private sector throughout their early career paths emphasised the difficulty and sometimes the unfavourable preconditions for getting a post in academia. A negative picture of the Greek academia is illustrated in the following example of a foreign-educated PhD graduate who explains why he did not pursue postdoctoral studies in Greece but also why he stopped considering an academic career in Greece:

> *"Let me tell you something. I was let down by academia in Greece, I will be honest to you. Having seen acquaintances and friends that pursued postgraduate studies in Greece, the situation is tragic. I will tell you very openly that you have to employ unfair means, to do whatever it takes in order to do anything. And to be honest, this is one of the reasons that although I have tried [to work] in academia for a bit when I came back from England, when I realised that you need to be enrolled at parties to be one or another, I said, Ladies and gentlemen this is not for me, goodbye. I spoke to many departments, either technological institutions or universities, they told me come but […] I said thanks, but no thanks!"*

[Uk2, male, computer and electrical engineering, private sector, Greece]

It is also suggested that the career choices of UK-educated returnees were shaped not only by individual characteristics but also by systemic variables. For example, the uncertainty and precariousness of academic and research posts, the limited job opportunities in academia, the lack of research infrastructure and funding in Greek academia, lack of internal networks and the non-meritocratic system of Greek academic sector were highlighted as barriers to re-integration and academic career development of returning UK educated PhD graduates in Greece. Many had had to readjust their career plans to non-academic jobs. This is in line with a study by Gill (2005) who reported similar barriers that Italian scientists' came across in their decision to return to Italy after working in the UK. The Italian academic system shares many similarities with the Greek in terms of the importance of personal contacts attributed to getting an academic post. Italian scientists in Gill's research reported that it is '*who you know not what you know'*, that would facilitate a return to Italian academia. Thus, it was vital to maintain contact and links with professional networks both in the Italian and the Greek system.

Inter-sectoral mobility[155], especially for researchers and highly skilled personnel, has been encouraged in recent European and international policy documents (EC-MORE, 2010; EC, 2006) with the view of highlighting the range of individual and collective benefits. Researchers diversify their career paths while research and innovation systems are boosted leading to higher knowledge transfer and the application of research which are characteristics of

[155] Inter- sectoral mobility is often addressed in academic studies related to careers of PhD graduates as such as in France (Mangemantin, 2000) and Germany (Enders and Bornmann, 2001)

knowledge based economies. However, inter-sectoral mobility in the Greek labour market is mainly one-way (from academia to non-academic paths), occurs due to limited occupational choice and fails to contribute to knowledge transfer and innovation as had been envisaged. In this study, this mobility was the result of push factors in the current Greek academic system rather than national or institutional efforts to enhance this type of mobility. This was demonstrated by the experiences of the interviewees in the case studies above. There were mainly structural reasons influencing their decision to undertake a job in the non-academic sector. Limited job opportunities and career prospects, lack of research infrastructure and funding in the Greek academic sector, the introvert character and the non-meritocratic recruitment system of Greek academia were all mentioned as 'push' away factors from academic jobs.

6.3 Characteristics of current employment 2-8 years after the PhD

This section sheds light on the current job situation of the study participants. It starts by looking at the current employment situation and the type of organisation that the study participants were working in. It refers back to reasons for doing a PhD while considering types of employment they entered paying attention to gender and graduate education in UK and Greece. After looking at the potential career paths of PhD graduates in this study, this section examines their current employment situation by distinguishing between those who worked in the academic sector and those in non-academic sector examining the working conditions and their satisfaction. Issues such as ways

of finding current job and motivations for undertaking employment are explored using the academic-non-academic comparison to elucidate potential differences between sectors.

6.3.1 Current employment: Type of organization, contractual basis of employment, SOC classification

Over 60% of respondents were working in HEIs or research institutes reflecting that the majority of the sample had been employed in traditional academic occupations. Nearly 20% were employed in private Greek enterprises or multinational companies and even less respondents were found in jobs in public services or state enterprises.

Table 6.2 -Type of organisation – current employment of respondents

Type of organization	Frequency	Percentage (%)
HEI	113	47.7
Research Institute	36	15.2
Public service	28	11.8
Private enterprise	26	11.0
Multinational	20	8.4
State enterprise	12	5.1
Private non for profit institution	2	0.8
Total	233	100.0

The overwhelming majority of respondents were in higher managerial and professional occupations (88%), most of the remained were in lower managerial and professional occupations. The few respondents who did not fall within these groups, were all working in the public/state sector. There is little evidence, therefore, of significant under-employment. The sectoral distribution of this study's respondents was similar to the findings of the GSRT

study (2008) which concerned all disciplines of Greek PhD graduates during 1995-2005 (Table 6.3[156]).

Table 6.3 GSRT report – type of organisation/current employment by PhD discipline

	Natural sciences	Engineering &technology	Medical sciences	Earth sciences	Social sciences	Humanities
Tertiary education institution	56.7	44.5	49.6	54.2	51	53.4
Public sector	21.6	18.1	27.5	28.5	29.2	34.5
Self employed	14.1	25.0	16.3	10.5	14.1	9.4
Private sector	3.9	5.7	2.4	3.7	1.8	1.8

GSRT: 2008, adjusted

Almost one third of respondents in this study reported that they had a second job, of which more than half had a second job in higher education or research institutions. Financial reasons and job satisfaction were the most frequently cited reasons. The academic – non-academic classification is used in for the remainder of this chapter and is based on the responses of the online survey regarding the type of organisation[157] they worked in. It aims to highlight characteristics of the Greek doctoral labour market and differences between the sectors for this highly skilled workforce.

[156] The high percentage of employment in the public sector included those working in research institutes.

[157] The academic sector includes higher education institutions and research institutes while the non-academic sector entails state enterprises, public services, private enterprises, multinational companies and private non for profit institutions. Since state enterprises and public services are part of the public sector in Greece, which is quite distinct compared to the private sector in some employment aspects, public sector considerations will inform the analysis where appropriate.

Current employment situation

At the time of the survey, over 75% of the respondents reported that they were in full-time employment. No great differences were observed between employment sectors in terms of the basis of employment apart from the finding that respondents in academic employment were more likely to be working part-time (8.7% versus 1.1% in non-academic).

It is important to note that in relation to their current employment, respondents in the study had low unemployment rates and a high proportion of self-employed. The low unemployment of the sample reported is in-line with data from the Greek LFS regarding the employment status of postgraduates with a Masters or doctorate as noted in chapter three. At the same time, the Greek labour market has been characterised by high rates of self-employment compared to its European counterparts.

Table 6.4 Current employment situation of respondents

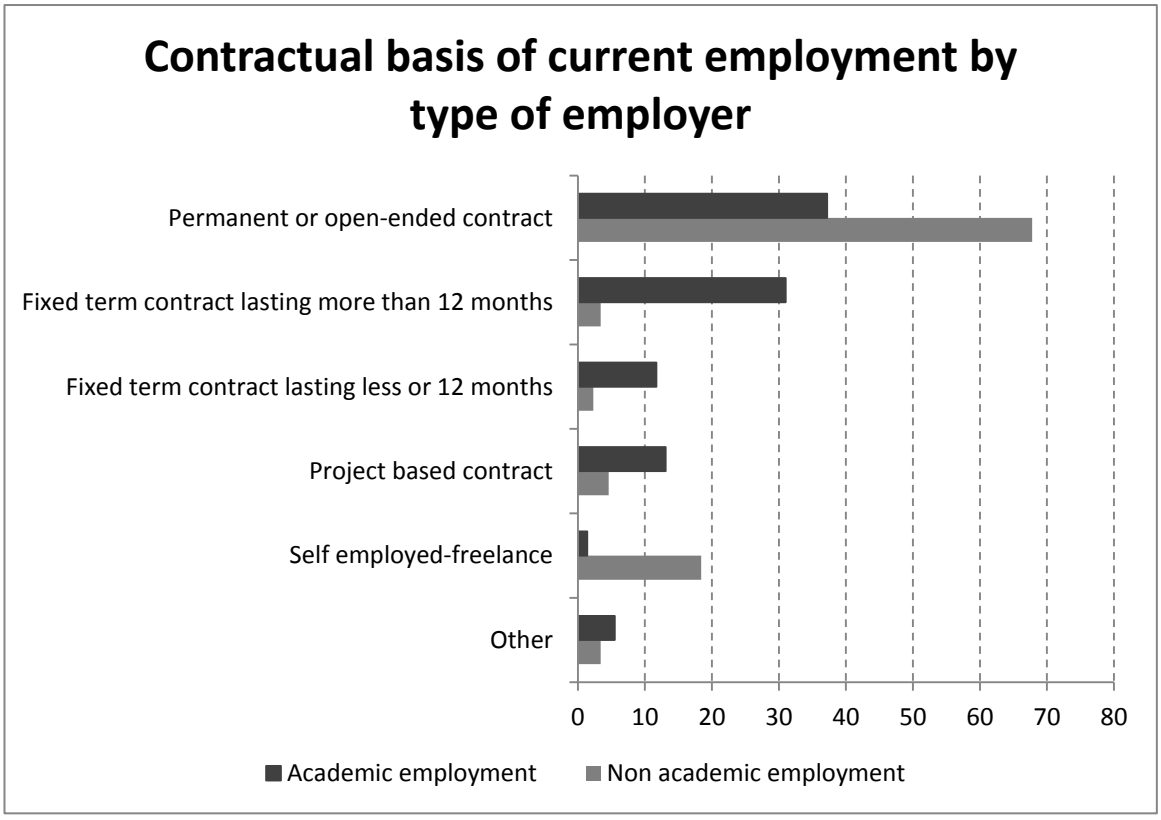
Current employment situation	Frequency	**Percentage (%)**
Employed full time	188	77
Self-employed/freelance	35	14.3
Employed part time	14	5.7
Unemployed & looking for work	4	1.6
Doing something else (travel, maternity)	2	0.8
Other	1	0.4
Total	**244**	**100.0**

Basis of employment

More than half of the respondents were working with a permanent or open-ended contract, but just under 40% had a temporary, either fixed-term or project-based contract. A striking difference is observed on employment basis

by type of employer. Almost three quarters of study participants working in the non-academic sector had a permanent or open-ended contract in contrast to only 37.2% of those in the academic sector, reflecting the temporary nature of early academic career paths of Greek PhD graduates as illustrated in section 6.2.2. This is also explained by the decreasing investment in higher education in Greece and the subsequent limited number of new academic vacancies by the Ministry of Education, as discussed in chapter three.

Figure 6-4 Contractual arrangements of current employment of respondents by type of employer



In this study, the difference between respondents working as lecturers and those working as teaching staff PD/407 was in terms of the contractual arrangements of their employment. Lecturers indicated that they had

permanent open- ended contracts[158] while teaching staff PD/407 had fixed-term contracts.

6.3.2 Employment choice and job seeking sources

The most popular means of finding employment appears to be professional contacts, followed by personal contacts reflecting the importance of informal networks for the Greek respondents of this study irrespective of country of education and employer classification. The findings are very similar to those conveyed in a Vitae report[159] (2010), with PhD graduates in the UK more likely to use professional contacts, compared with less qualified graduates and networks being the '*key to finding employment'* (p.26). In Greece, public competition is used extensively since all posts in the academic sector and public/state sector (non-academic) are advertised in the Official Gazette of the Hellenic Republic and they are filled on the basis of public competition.

Only five participants indicated the career services of the institution where they studied as a source of leading to their current job. Career services in Greek universities have only recently been established and do not constitute part of the university budget. Despite using the university premises, they are dependent financially on European Union programmes. This dependence and their isolation from the university structure hinders their long-term development, pursuing short term objectives.

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[158] According to Greek law 1268/1982, lecturers in Greek universities, are elected with a three years minimum 'service' after which they can progress (by election) to senior lecturers entering the tenure-track system . Lecturers in this study translated 'service' as open ended/permanent contract - rather than a fixed term contract - since it has been rare for a lecturer in Greece not to get promoted to the next academic rank.

[159] The Vitae report (2010) is using the Longitudinal DLHE data for the graduates of 2004/05 cohort.

Table 6.5 Sources used by respondents to find their current job

How did you find your current job?	N	Percent of cases (%)[160]
Professional contacts	71	31.1
Personal contacts incl. family, friends	49	21.5
Public competition	45	19.7
Employer's website	38	16.7
Newspaper/magazine/website	38	16.7
Already/previously worked there	37	16.2
Other[161]	26	11.4
Careers service	5	2.2
Recruitment office/website	4	1.8
Total	**313**	

However, the specific characteristics of PhD recruitment might also account for limited use of career services. PhD employers seeking for specialised knowledge of PhD graduates are more likely to identify future employees by establishing relationships with academic departments rather than career services. This is also evidenced by the restricted use of UK university careers services[162]. According to the Vitae report (2010), only 4.9% of the PhD graduates found their current employment through their doctoral institutions' careers services.

[160] This was a multiple response question where it was possible to indicate more than one source.
[161] The 'other' category included procurement of posts either in academic employment e.g. academic or public sector vacancies advertised in the official gazette.
[162] UK universities'Career Services are part of the universities' structure and are more sophisticated than the equivalent services in Greek universities.

Academic sector

Respondents in academic employment were more likely to have obtained their job while already working in higher education. This is not surprising, considering that often PhD candidates were employed during their doctorate through their professional contacts and were getting temporary jobs after the PhD. The 'endogamy' (Kakepaki and Sotiropoulos, 2006) of the Greek higher education system and the preference of the 'internal candidates' in terms of recruitment and promotion of academic staff also explain these data to some extent.

Since all academic jobs are announced in the official governmental newspaper – required by law – PhD graduates interested in academia were more likely to monitor this newspaper. The small size of the Greek academic labour market and the use of the governmental newspaper for academic vacancies has prevented the development of online websites or agencies devoted only to academic jobs as is the case in the UK.

Non-academic sector

Respondents in non-academic employment were more likely to have obtained their job through public competition. This is explained by the number of respondents working in the public sector (public services and state enterprises). Public sector posts require candidates to undertake a public competition where they are selected on the basis of their applications and sometimes exams. Although a PhD might not be required for a public sector post, it is explicitly indicated that the doctorate – if relevant to the subject of the

employment – provides extra points to the application of the PhD graduate.[163] Recruitment agencies were used exclusively by respondents working in the private sector.

Reasons for undertaking current job

The decision for current employment choices was complex. More than half of the respondents (59%) were found – at the time of the survey – in a position that fitted their career plans. Comparing the responses of participants working in academic and non-academic workplaces, no striking differences were observed. For example, respondents in both sectors, indicated that their job decisions were influenced by their desire to broaden their experience or earn a living.

Nevertheless, respondents in non-academic sectors were more likely to consider the salary level when they were deciding on their current employment which is explained by the earnings' differences illustrated in the next section. Respondents in the academic sector were more likely to report that they decided to do their current job because they wanted to specifically work in this sector. This is unsurprising, considering the traditional perception of the PhD as a passport to academia.

[163] There is a number of different factors that provide extra points in public sector competitions: the type of qualification is playing an important role (e.g. you get 50 extra points for a first degree, 80 for a Masters and 150 for a PhD), language qualifications, IT qualifications, family conditions (e.g. if you are member of a large family or members of the family present some kind of disability) etc.

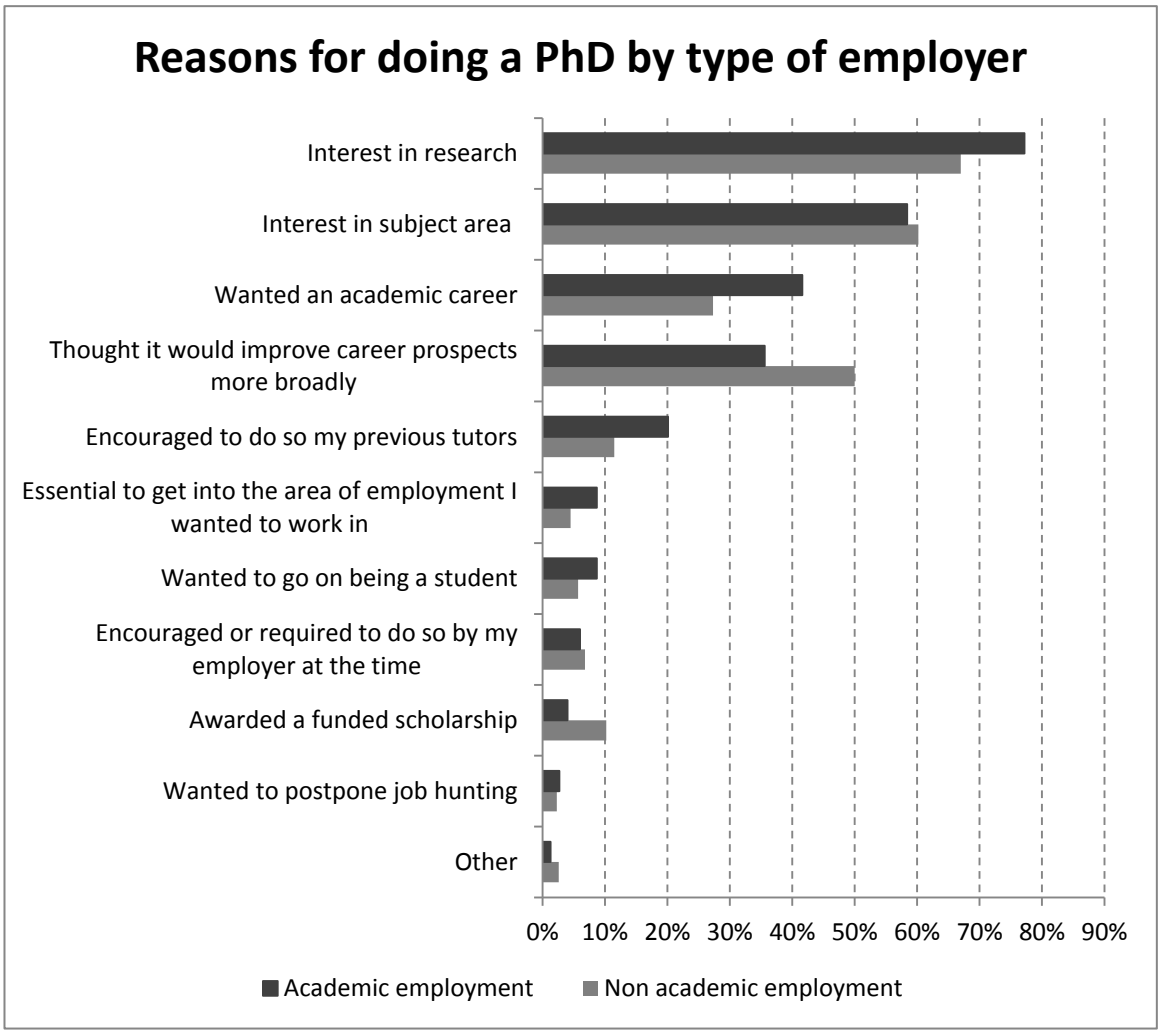
Table 6.6 Reasons for undertaking current employment by type of employer

Reasons for undertaking current employment	Academic employment	Non-academic employment
It fitted my career plans	66.2%	49.4%
I wanted to work in this specific sector (e.g. private sector, public sector)	44.8%	24.1%
It was exactly the type of work I wanted	38.6%	16.1%
To broaden experience/develop general skills	24.8%	24.1%
To earn a living	23.4%	20.7%
To gain experience to get the job I really wanted	15.2%	8.0%
I wanted to work in this region	15.2%	13.8%
The salary level was attractive	11.0%	19.5%
It was the only job offer I had	10.3%	9.2%
It was an opportunity to progress in the organisation	9.7%	10.3%
To see if I would like the type of job involved	8.3%	8.0%
Other	0.7%	4.6%

The cross- tabulation of PhD motivation with sector of current employment demonstrated a similar picture to the rationales behind decision for current job. Combining survey and interview data showed that PhD motivation was linked to the career paths of the participants at the time of the survey. Study participants who undertook a PhD primarily because they were interested in the subject area or research and wanted an academic career, were more likely to work in academic or research jobs. Conversely, those who indicated that the PhD would improve their career prospects generally, were more likely to work in the non-academic sector. The majority of the latter occupied managerial and senior positions in public and private sector such as senior

consultants/directors of units, specialised scientific personnel in public services. Interestingly, a few respondents were working as secondary education teachers or had their own private company (often engineers) where the PhD was not an explicit requirement, although it may confer advantages.

Figure 6-5 Reasons for undertaking doctoral education by current employment sector



There were of course cases that did not conform to this pattern especially when other factors came into play such as age and career stage of individual, labour market opportunities, changing aspirations and chance. While long-term career motivation might be related to career paths, there are other aspects of

doctoral education that interact and overlap with the reasons that individuals decide to pursue a PhD.

6.3.3 Earnings of PhD graduates

PhD graduates surveyed were found to earn a wide range of salaries. Most respondents earned 2,000-3,000 Euros per month while the second most frequently selected salary band was 1,251-1,500 Euros. The minimum wage in Greece during the last five years has been about 700-800 Euros, so 10% of the respondents had a low monthly wage (<1,000 Euros) despite their high qualifications (Eurostat,online).

The majority of respondents in this study enjoyed monthly earnings which could be characterised as expected (between 1,000 and 2,000 Euros) since the average earnings in early academic or research posts according to law was between 1,000-1,700 Euros. Since the respondents of this sample were in their early career paths, most PhD graduates were in the first two academic/research ranks (lecturer-assistant professor/ Δ' or Γ' researcher). The earnings of PhD graduates has often been investigated compared to other educational levels – using LFS data – to determine the 'financial' value of the PhD both in the UK and Greece (O'Leary and Sloane, 2004; Mitrakos et al., 2010). In Greece, it was reported that PhD graduates enjoyed high earnings justifying investment in education. While Mitrakos et al. (2010) demonstrated that the annual returns of postgraduates (Master's level) were higher than

those of PhD graduates, they underlined that this situation was reversed when the overall returns of doctoral education were considered[164].

Salary in the academic and non-academic sector

According to the survey, the salary levels differed between the academic and non-academic sector. As figure 6.9 shows, the most frequent response (the mode) of respondents in non-academic employment was 2,000-3,000€ of monthly earnings which was higher than the equivalent of 1,251-1,500€ of respondents in academic employment. In addition, the comparison of the respondents by country of employment demonstrated study respondents working abroad were paid higher salaries than their counterparts in Greece.

A European survey on researchers[165] in the public and private sector (EC, 2007) highlighted the low earnings of researchers in the Greek labour market through comparisons in different countries taking into account purchasing power standards (PPS) (EC, 2007). According to this survey, Greece had the lowest remuneration in Euros (26,685[166]) and in terms of PPS (30,835) in 2006[167][168].

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[164] This conclusion was based on the assumption that doctoral education lasted for three years while Master's degree lasted for one year.

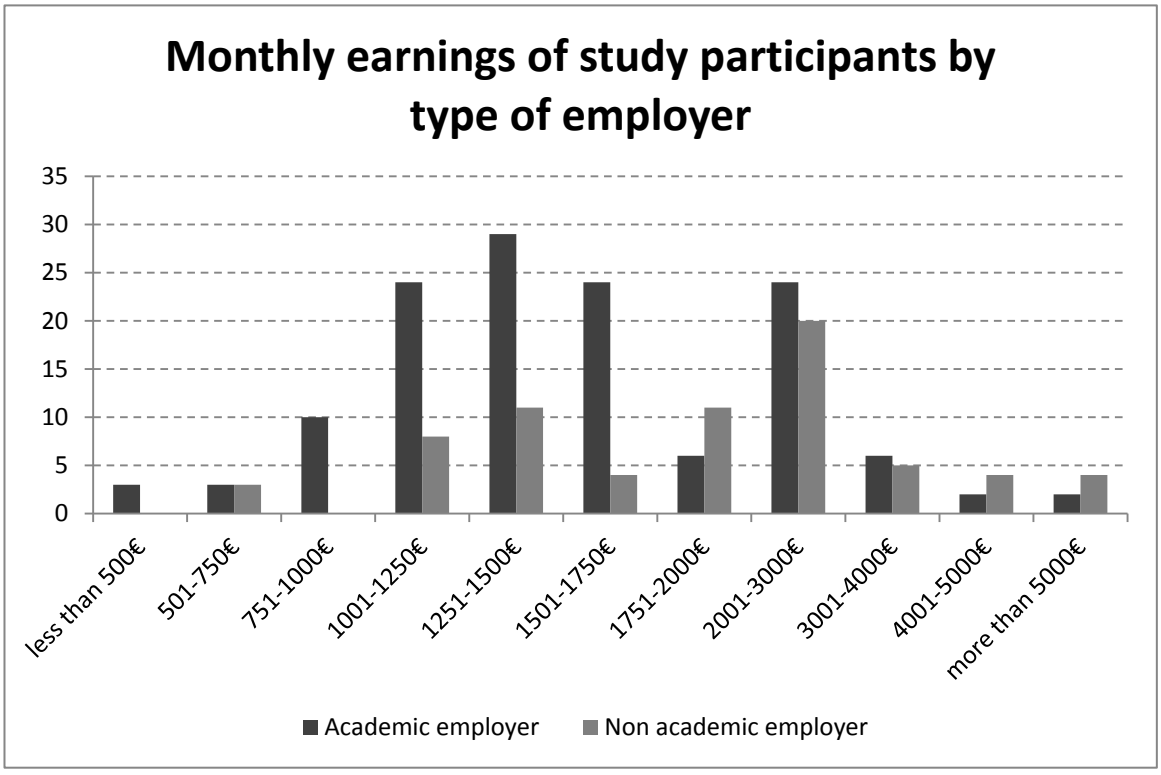
[165] This study received 6,110 valid replies used for the comparisons of salary costs. Greece is considered as one of the countries with high accuracy of replies although its samples is comprised of 115 replies from Greece. Researcher is defined in this study as 'any person who devotes at least 50% of her/his time to carry out research activities; (EC, 2007). This definition is adopted from the Frascati Manual (OECD).

[166] Taking into account the adjustment coefficient for the correction of study results, the average weighted total yearly salary adjusted for Greece is 25,685.

[167] In terms of PPS, other countries presented the following yearly salary average of researchers (EC, 2007, p.19): UK (52,776), Cyprus (50,549), US (62,793), EU average (40.126). It was reported that Greece had a quite small gap (14.27%) in the yearly salary averages (at all levels of experience) in gender terms compared to UK (25.59%) (ibid, p.47-48). Furthermore, there were distinct differences in the annual salary averages of researchers

Higher earnings' responses were primarily linked to the private sector (private companies and multinational companies) rather than public sector earnings since only two respondents working in the public sector had a salary of between 4,000-5,000€. This picture may be explained by the fact that a small number of PhD graduates in Greece were working in non-academic employment in this study.

Figure 6-6 Monthly earnings of respondents by type of employer



by sector of activity with Greek researchers in the business sector getting 29.,276 in PPS against 39,452 in the governmental and 32,045 in the higher education sector.

[168] Greece was characterised as a 'neutral relative increase country' as opposed to a 'high relative increase country' (EC, 2007, p.53) such as the UK. When the average annual earnings were calculated in terms of level of experience (all currencies in PPS) then salaries in Greece increased in equal terms (about 7,000 in PPS for each level, 0-4, 5-7,8-10,11-15 and over 15 years). In contrast, the UK has a starting salary that is quite low but the increases are quite high as experience became greater (ibid, p.51).

6.4 Satisfaction with career and current employment

The experience of PhD graduates in employment in their early careers leads 45% of survey respondents to say they are quite satisfied, with their careers to date, 24% are very satisfied and 19% neither satisfied nor unsatisfied. We might expect these degrees of satisfaction to differ according to, for example, stage of career, discipline, country of doctorate, country of employment, sector of employment, type of organisation and occupation. Measures of average satisfaction are shown in Table 6.8.

Table 6.7 Average satisfaction of the sample with aspects of current employment

Aspects of current job	Mean
Salary	4.20
Promotion prospects	4.62
Job security	4.63
Interesting tasks	5.39
Independent work	5.27
Working conditions	5.30
Meeting career goals	4.77
Life work balance	4.70
Relevance with doctoral education	5.12
Working hours	4.92
Location of employment	5.27
Status of employment	5.15

(N=220)

However, it is difficult to put forward strong *a priori* hypotheses about the patterns that might be expected to emerge from the data without adding a great deal of supplementary (notably relating to expectations) and contextual information, such as the sectoral/occupational labour market situations they face, and theorizing about the impact of different organisational forms and dimensions of rewards on working environments and reactions to them.

Here, instead the emphasis is not upon *career* satisfaction *per se* but more specifically on satisfaction with the current job held. The survey findings (Question B15) include responses about degrees of satisfaction with twelve different aspects of the job. This section seeks to establish the extent to which these reflect independent elements of the job or can be reducible down to a smaller number of underlying features or latent factors that more effectively represent sources of satisfaction. It then compares the indications of job satisfaction across sector and country of doctoral study and employment. Contrasts are made with insights from other studies.

6.4.1 Current job satisfaction: using Principal Component Analysis

So far, it has been shown that barely 2% of respondents were unemployed. Most were employed in traditional academic or more broadly, higher managerial and professional occupations. Different salaries and contractual arrangements are found by sector of employment. However, it is not clear to what extent such differences are significant for the respondents and which are the main dimensions of their current job that they are mostly satisfied. Further analysis of the job satisfaction of respondents could provide a better understanding of the dimensions that seem to matter most and the associations between them.

While the average satisfaction measures provide an overview of participants' degrees of satisfaction, I have used principal component analysis so as to reduce the data to identify any clustering of different elements of their experience into dimensions that more fundamentally underlie them. Other

studies have used factor analysis techniques to explore job satisfaction[169] (Quinn and Shepard, 1974; Kalleberg, 1977). Such research also offers a potentially more effective way of comparing the key findings from studies that choose to explore job satisfaction through different sets of specific questions.

Prior tests ensured that the characteritics of the specific dataset made this method as an appropriate tool of analysis. The sample size was fair to good (N=220) (Comrey and Lee,1992), and the related values for factorability of the sample were adequate (the Bartlett's test of sphericity had sig.=.000< sig=.05 and the Kaiser Meter Olkin (KMO) value of sampling adequacy was .841 which is characterised as 'meritorious' by Kaiser (1974, p.35)**.**A principal component analysis was used with varimax rotations (factors are independent). Three components were identified according to the screeplot and their eigenvalues[170] (see Table 6.9) which account for 64.9% of the variance. Additionally an oblique rotation was applied (factor interdependent) and produced a simial result.

[169] The differences between exploratory factor analysis and principal component analysis are based on the purpose and the assumptions of the analysis. PCA aims at data reduction and assumes that the components extracted are based on the 'measured responses'. On the contrary, factor analysis' purpose is *'making statements about the factors that are responsible for a set of observed responses'* (DeCoster, 1998, p.3).

[170] At the same time, another way to decide the number of factors to retain is using parallel analysis which is a statistical programme developed my Watkins (2000). This programme is called Monte Carlo PCA for Parallel Analysis and it generates 100 random data of the same size as my survey data (12 variables x 220 cases). The comparison between the eigenvalues of the Parallel analysis with the eigenvalues that were obtained by SPSS (the total variance explained table) will provide information on which factors to retain. Factors with values higher than the values from the parallel analysis were kept in the analysis. Therefore the first three factors are retained confirming Kaiser's criterion and the scree plot.

Table 6.8 Principal component analysis: Rotated Component Matrix

Factor loadings				
		Factor 1	**Factor 2**	**Factor 3**
Factor 1: Intrinsic dimension	interesting tasks	.844		
	relevance with doctoral education	.779		
	meeting career goals	.773		
	independent work	.710		
	status of employment	.563		
Factor 2 : Working life	working hours		.861	
	life work balance		.847	
	working conditions		.656	
	location of employment		.570	
Factor 3 : Financial	salary			.807
	job security			.645
	promotion prospects	.649		.593
Variance explained (%)	**Total (64.954)**	**40.165**	**14.685**	**10.104**
Cronbach alpha	0,832	**0.832**	**0.771**	**0.620**

Extraction method: Principal component analysis., Rotation: Varimax..

The reliability of these three dimensions was evaluated through the computation of Cronbach's alpha, which is the most common measure of internal consistency reliability. According to George and Mallery (2003) when the alpha value is over 0.8 or .07 there is good or acceptable internal consistency of scale items. The Cronbach's alpha was 0.832, 0.771 and 0.620 respectively for the three components, showing acceptable values. Therefore, there is a high internal consistency for factor 1, a fair one for factor 2 but factor 3 shows a questionable internal consistency.

Previous studies have examined job satisfaction using factor analysis techniques (Quinn and Sheppard,1974; Kalleberg,1977). Based on previous research and on the interpretation of the three factors identified in the analysis, were labelled in the following way: Factor 1- the 'intrinsic' dimension; Factor 2:

the ‘working life’ dimension; and Factor 3- the ‘financial’ dimension. These labels are explained further below.

Kalleberg (1977) following the dimensions identified by Quinn and Shepard (1974), found six similar dimensions of job satisfaction: intrinsic, convenience, financial, relationship with co-workers, career and resource adequacy. The intrinsic dimension refers to the nature of responsibilities and tasks that individuals undertake in their employment (Kalleberg, 1977). For example, whether these tasks enable individuals to develop abilities, and to what extent they are interesting and challenging. Research on academics’ satisfaction has highlighted the significance of intrinsic attributes of employment for this professional group (Lacy and Sheehan, 1997).

In this study, the intrinsic dimension included: interesting tasks; independent work; meeting career goals; relevance with doctoral education; and status of employment. While meeting career goals and promotion prospects might be considered linked and interrelated for some, it has previously been found that many scientists and academics might perceive such a connection as not being so important to them. Purcell et al. (2010, p.37[171]) described cases of UK PhD graduates who preferred undertaking work relevant to their area of interest rather than getting a promotion, which would divert them from activities they enjoyed. Therefore, considering the lower loading, the item ‘promotion prospects’ was included in factor-3 related to the financial dimension (where it

[171] For example, a statistician enjoyed undertaking complex calculations in his job and a promotion would be translated into less time spent on such a task and more emphasis on people management, which he did not like to do.

presented a similar loading). The underlying ideas is that promotion is interpreted as advancement relevant to prospective earnings, and thus, has financial implications[172].

The 'working life' component is similar to the convenience dimension identified by Kalleberg (1977, p.128) which *'concerns a valuation of facets external to the task itself'.* This includes 'extrinsic' characteristics of the job such as working hours, working conditions, work-life balance, and location.

The third dimension refers to the financial returns to employment which *"reflects a worker's desire to obtain present and future monetary rewards from a job"* (ibid, p. 128). This component underlines the salary, promotion prospects and job security which are together interpreted as reflecting the likely level and security life-time earnings.

The work life and financial factors are essentially extrinsic to the (intrinsic) nature of the work itself. Whilst 'relationships with co-workers', 'career' and 'resource' adequacy were also characterised by Kalleberg (1977), the investigation of such dimensions goes beyond the scope of this study.

6.4.2 Comparing groups

In order to compare the different items of job satisfaction among distinct groups of respondents, cross-tabulations (descriptive analysis) and

[172] Factor analysis is a useful approach which needs to be complemented with research findings and theories that explain the data. In this case, the interpretation of promotion prospects as relevant to the financial earnings led to the inclusion of this variable under the financial dimension factor.

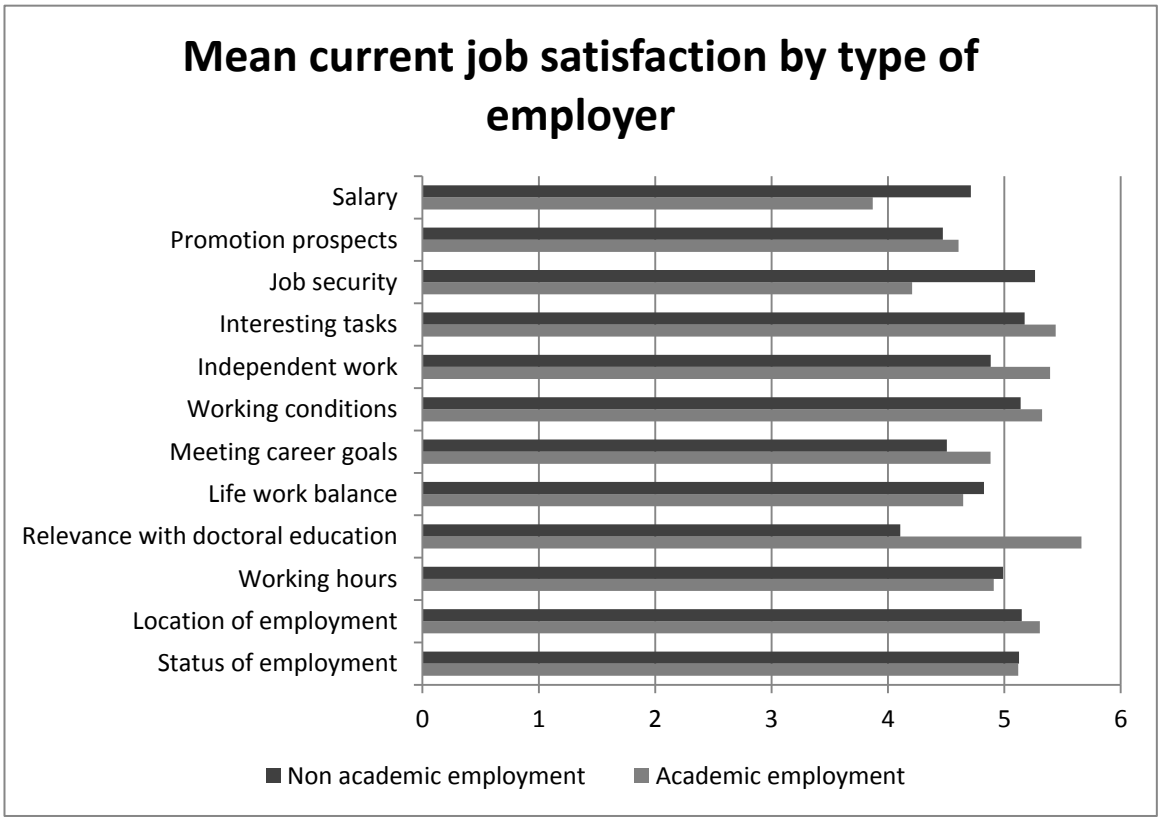
independent t-tests were undertaken (see Appendix IV). Factor scores[173] were produced using the Anderson –Rubin method[174] and were used in the independent t-test to compare the relative satisfaction of respondents grouped by sector, country of employment and doctoral education.

Comparing the participants who completed their PhD in the UK and Greece in terms of satisfaction in their current job, it seems that those with a PhD from a UK institution have a slightly higher mean in almost all aspects of current employment. Job security, work-life balance and working hours were the only aspects scoring higher by the Greek-educated. Similarly, the results from the PCA showed that the foreign-educated appeared to be more satisfied with the intrinsic dimension and their financial rewards of their current employment than the domicile educated. However, the independent t-tests of the factor scores showed no significant difference between the two groups ($p > 0.05$).

Important differences were observed between respondents in academic and non-academic employment in terms of salary, job security and relevance with doctoral education (Figure 6.9). The scores on intrinsic aspects of employment were slightly higher for those working in academia.

[173] Factor scores represent a composite score for each individual on a particular factor and were used as variables.
[174] The Anderson-Rubin produces factors scores that are uncorrelated and standardised.

Figure 6-7 Mean job satisfaction of respondents by type of current employer



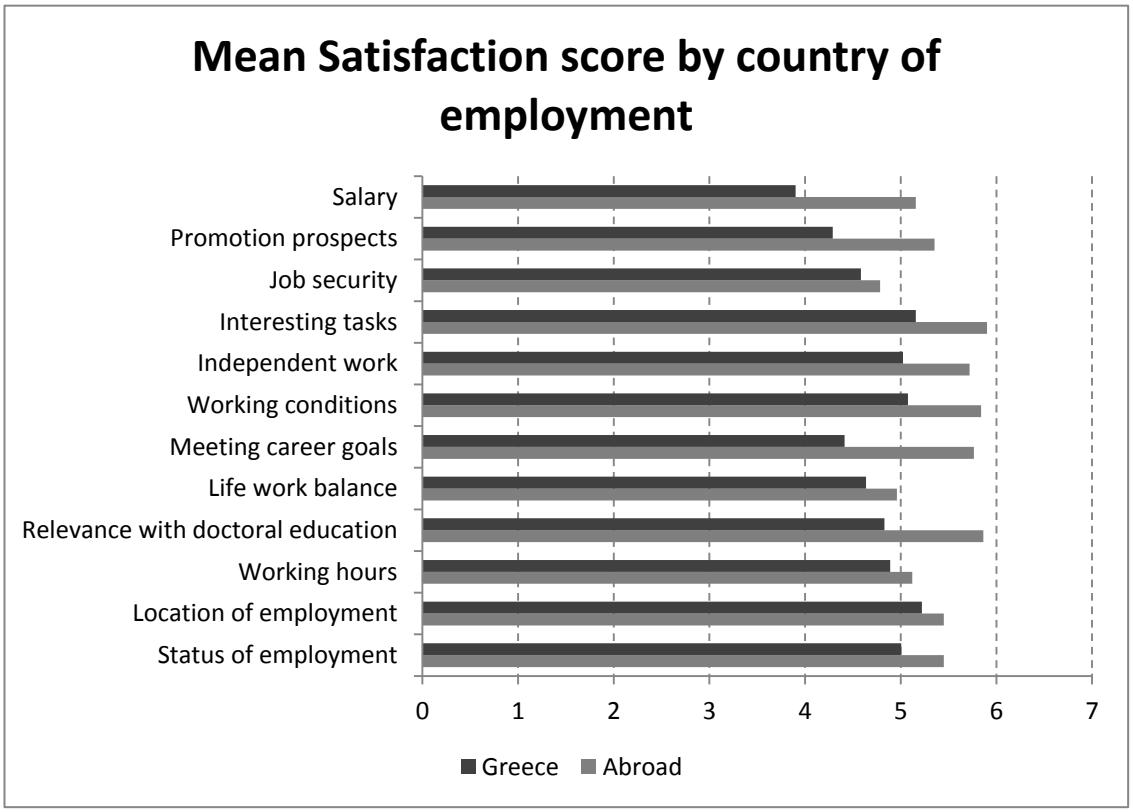
Earnings of academics have recurrently been compared to the high salaries enjoyed outside academia in various national contexts (Enders and Musselin, 2008; Kubler and Roberts, 2005; McGraw and Mrdjenovic, 2005). Respondents in academia demonstrated lower satisfaction in terms of job security compared to those working in the non-academic sector. Doctorate holders pursuing an academic career were more likely to be working under temporary or fixed-term contracts in their early career experience. Naturally participants working in academia were more likely to be occupied in jobs relevant to their doctorate. The higher satisfaction reported by those working in academia is reflected in the traditional perception of the PhD as an academic passport and the predominance of Greek doctorate holders in higher education and research in this study.

The significance of these differences was also reflected in the results of the independent t-tests on the factor scores of individuals between these two groups. Respondents working in academia reported higher satisfaction with the intrinsic characteristics of their current job than those working in the non-academic sector (.225 versus -.387, $p=0.00<0.05$). In addition, the negative value of the mean in the respondents of the non-academic sector shows an even greater difference between the two groups. Other studies focused on the job satisfaction of faculty staff have reported on the high importance of intrinsic aspects attributed by academics in terms of satisfaction (Moses, 1986; Morrison et al., 2010[175]) or career decisions (Finkelstein, 1984; Manger and Eikeland, 1990).

Comparing satisfaction data by country of current employment, it appears that those working abroad are more satisifed in all aspects of employment, both intrinsic and extrinsic, in comparison to those working in Greece. Respondents working abroad report greater satisfaction (on average) than their counterparts in Greece in terms of salary, career prospects (meeting career goals), working conditions and interesting tasks. Most importantly, those employed abroad are much more satisfied with the relevance of their current job with their doctoral education.

[175] While their research focused on the influence of prestige of a factor for job satisfaction, it is reported that the faculty in their sample reported high levels of satisfaction in terms of autonomy and intellectual challenge.

Figure 6-8 Mean job satisfaction by country of current employment



Considering the three components of job satisfaction, the respondents currently working abroad reported a higher satisfaction with the intrinsic and financial dimension of their work in comparison with the ones working in Greece (intrinsic: .440 versus -.150, $p=0.00<0.05$ and financial: .280 versus -.085, $p=0.012<0.05$). In the latter respondents, the mean had a negative value in both dimensions (-.150 for the intrinsic and -.085 for the financial). This could be explained by the higher financial earnings abroad, although differences in living costs should be considered. The great difference in the intrinsic aspect might suggest that respondents working abroad are more likely to find themselves in jobs that are more satisfying in terms of interesting and independent tasks and more importantly that are relevant to their doctorate. This is suggested with caution since the subsamples were not equal and this

result is based on the subjective perceptions of study participants. However, all respondents are Greek and their responses might to some extent reflect the current Greek labour market.

6.5 Conclusions

The sample of this study was small, especially of respondents who completed their PhD in the UK. Nevertheless, as shown in chapter four, this sample presents similar characteristics in terms of gender and age distribution to the respective population and is likely to be indicative of patterns in the wider population.

The first section showed that the majority of survey respondents have remained in their first employment activity since their doctoral studies. This group were mainly Greek-educated working in the academic sector, being satisfied with their current employment. Supporting previous research on early career building experience of PhD graduates – which was common among disciplines and different countries – a typical career path in Greek academia was shown, comprised of many intermediary temporary teaching and research posts that PhD graduates had to undertake as a necessary step for progression to tenured academic posts.

Career paths in the non-academic sector were less common among participants in this study, but they were characterised by more secure working arrangements. Participants with a PhD from engineering and biological sciences showed higher propensity to follow non-academic paths compared to other disciplinary groups due to the links with the Greek industry.

Inter-sectoral mobility was also observed between the first and current employment activity. Greek-educated respondents moved between academic and non-academic sector, but for different reasons. The move towards the non-academic sector was triggered by mainly practical reasons (earning a living, the attractiveness of salary or developing skills), while respondents who left the non-academic sector for academic occupations reported the fulfilment of career aspirations and plans.

Conversely, UK-educated PhDs, who returned to Greece soon after their PhD, experienced mainly one-way inter-sectoral mobility. While these returnees followed the same path of their Greek-educated counterparts, undertaking temporary academic posts after their PhD, they were more likely to be found working in the non-academic sector in their current employment, particularly vulnerable to the closed and paternalistic nature of the Greek academic system. This was further evidenced by the accounts of the Greek-educated who stressed the significance of previous work experience (often in the same institution where the PhD was undertaken) and the key role of professional and personal networks showing the informality of recruitment channels in scientific careers.

The instability and insecurity of the temporary posts, the lack of a clearly defined path, the poor research infrastructure, the high competition with internal candidates and the limited opportunities for more permanent jobs in the academic and research sector were highlighted – by both UK and Greek-

educated as reasons for mobility towards non-academic employment. The current economic climate in Greece is likely to exacerbate this further.

Overall, between two and six years after PhD completion, the current employment of the study participants was largely positive, mainly in managerial and professional occupations which fitted their career plans and with low likelihood of unemployment. However, the majority of respondents were working in traditional academic jobs in Greece with less longer-term security and lower earnings than those in the non-academic sector. The high number of temporary, project-based contractual arrangements and high proportion of self-employment in the academic occupations of the participants confirms further the precarious character of the 'typical' early career paths of PhD graduates.

A strong relationship was found between PhD motivation and career trajectory. For example PhD graduates with extrinsic motivation for a PhD – and often a first degree in engineering – were mostly found in the private or public sector. In contrast, doctorate holders were more likely to follow academic careers when they were motivated by interest in a subject area or research.

The principal component analysis on job satisfaction with current employment showed significant differences between respondents in terms of sector and country of employment. Respondents working in the academic sector reported higher satisfaction with intrinsic aspects of their current job (independence, interesting tasks, and relevance with the PhD) whereas those in non-academic employment were more satisfied with the job security and the earnings of their job. Thus it appears that employment in the private sector was less likely to

include characteristics such as relevance with the doctorate suggesting that respondents in non-academia might find it difficult to combine a non-academic career related to their PhD. This will be further explored in later chapters.

Finally, the higher satisfaction of respondents working abroad in both intrinsic and financial aspects of their employment compared to employees in Greece could suggest a better developed doctoral labour market abroad which potentially attributes higher value on the PhD credential. Moreover, concerns about potential brain drain of highly qualified workforce are raised considering the option of more satisfying careers abroad and the current economic downturn in Greece.

Chapter 7 THE VALUE AND THE ROLE OF THE PHD

7.1 Introduction

This chapter focuses on the role of the PhD in employment, career choices and beyond, as reflected in the online survey and the retrospective accounts. As discussed in chapter two, the role of the PhD has been often examined under economic and financial lenses comparing earnings of PhD graduates with other graduate levels. Nevertheless, apart from regarding the doctorate as an educational investment with a financial value in terms of earnings, the acquisition of this qualification can be beneficial in other terms (Nerad and Cerny, 1999; Burgess et al., 1998). Raddon and Sung (2009) have highlighted the gap in the literature regarding the personal and social impact of the doctorate through in-depth qualitative studies. This chapter reports on the role of the PhD in professional terms encompassing its impact on personal development and social sphere. This section concludes with an overview of four career profiles identified in this study and the role of the PhD in each.

7.2 Findings from this study: online survey and interviews

Within the online survey, the value of the PhD was examined in terms of its importance for employment and use of the skills and knowledge in their current job. Through the qualitative information from the interviews, the role of the PhD was also investigated beyond the workplace in regard to its contribution to personal development and quality of life. Where appropriate, the analyses

included comparing different groups by sector of employment, country of doctoral study and current employment.

7.2.1 Importance in getting a job

Rudd (1986) argued that the value of a PhD in science or technology can be examined in a number of different ways such as the pattern of employment and the requirement of having a job, intangible value and role of PhD in career paths as it is self-reported by the PhD graduates themselves and employers' attitudes[176]. While the latter is explored at chapter nine, this section focuses on the requirement for a PhD in different sectors as reported in the survey responses. The importance attributed to the PhD for employment differed between the academic and non-academic sector of employment. About three quarters of survey respondents working in academia reported that the PhD has been a formal requirement for their current job[177], but this was the case for only 16% in non-academic employment indicated this. The latter felt that subject of study and evidence of skills and competences gained during their doctoral studies contributed more than the PhD towards getting their current job.

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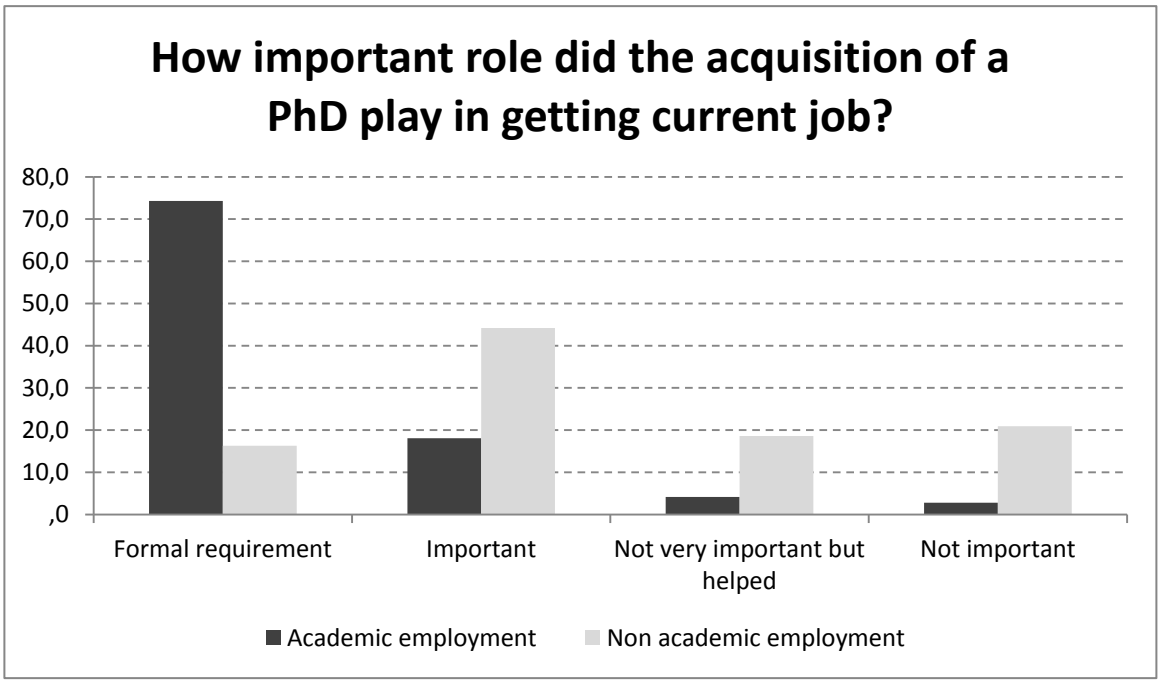
[176] Some of his suggestions for investigating the value of the PhD are cited below (Rudd, 1986, p.223): "By looking at the pattern of employment of graduates to discover whether there are certain specific jobs that PhDs enter, and whether a PhD is necessary for entry into the jobs, or gives any advantage in them. […] some of the individual graduates' gains may take a less tangible form, so it is legitimate to ask them what they think they have gained from their PhDs, and how relevant the PhD has been to their careers.[…] similarly one can look at individual employers' attitudes towards the PhD as shown by the extent to which they recruit only PhDs for certain kinds of post, and the extent to which they try to retain the services of PhDs by offering them attractive careers

[177] In order to be eligible to apply for an academic post in Greece it is required by law to have a PhD.

Figure 7-1 Importance of the PhD in the acquisition of current employment



More than three quarters of PhD graduates working abroad (76.5%) were more likely than their counterparts working in Greece (45.5%) to be employed in occupations where the doctorate was a formal requirement. Separating these groups further by country of doctoral education, the doctorate was even less likely to be a formal requirement for the current employment of foreign-educated returnees (see table 7.1). Foreign-educated returnees had found it difficult to access more permanent academic posts and were more likely to work in the non-academic sector which did not necessitate a PhD.

Table 7.1 Role of PhD in current job by country of PhD and current employment

Role of PhD in getting current employment Valid percent (%)[178]		
	Formal requirement (%)	**Important (%)**
Greek-ed ucated and work in Greece	**48.7**	**27.9**
Greek-educated and work abroad	**81.5**	**7.4**
UK-educated and work in Greece	**26.3**	**52.6**
UK-educated and work abroad	**68**	**28**

7.2.2 Using skills and knowledge in current employment

Survey participants also reported how often they used skils and knowledge acquired during their doctoral studies (figure 8.3.). A striking difference concerned the extent to which respondents from the two sectors used the detailed knowledge of their PhD (70.1% versus 26.1% for most of the time). Not surprisingly, academic sector respondents were more likely to use their research and general disciplinary knowledge than their counterparts in the non-academic sector (Figure 7-2).

[178] Missing responses (19) due to respondents not indicating country of current employment were not estimated.

Figure 7-2 Use of skills and knowledge in current employment by type of employer

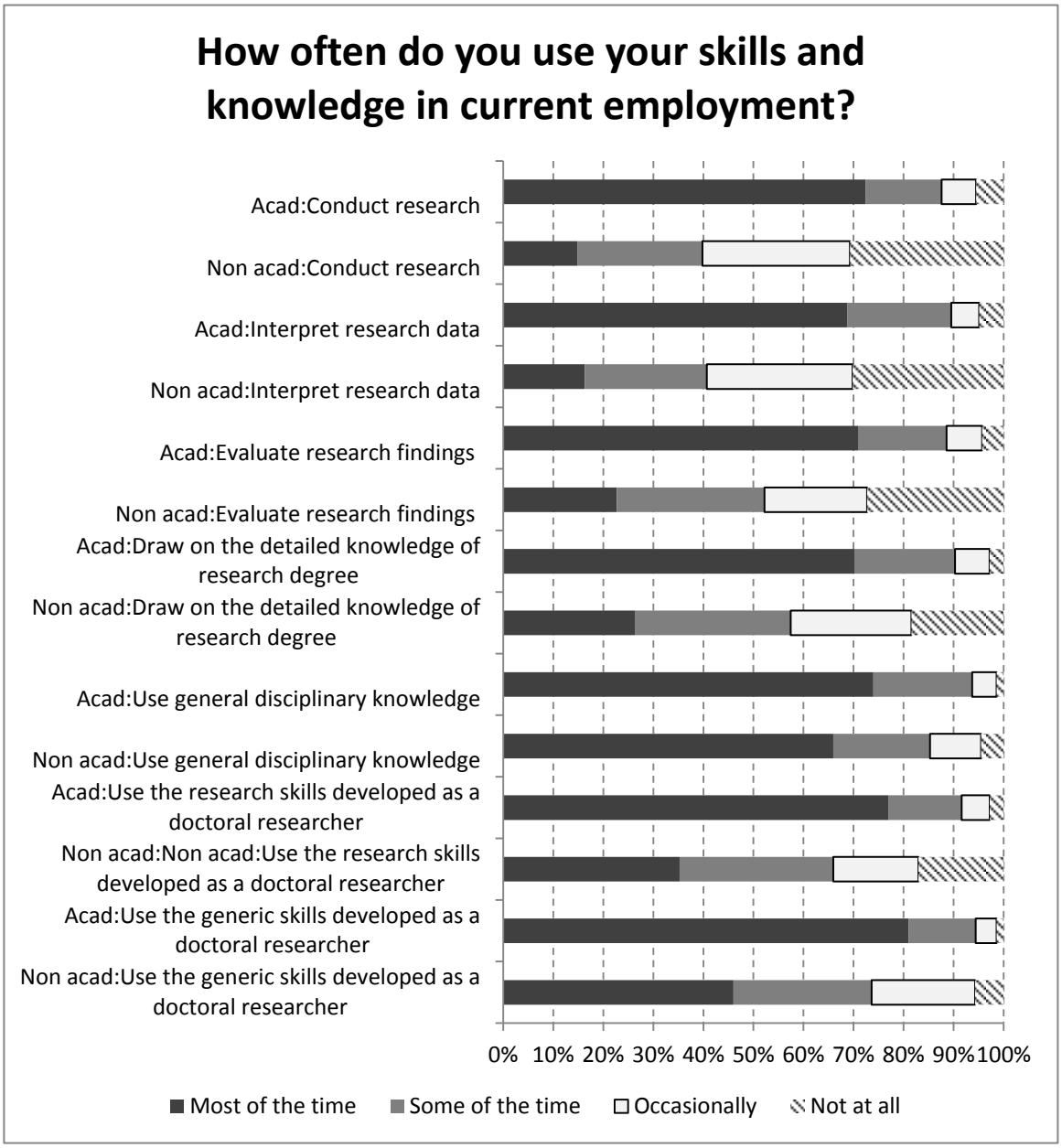
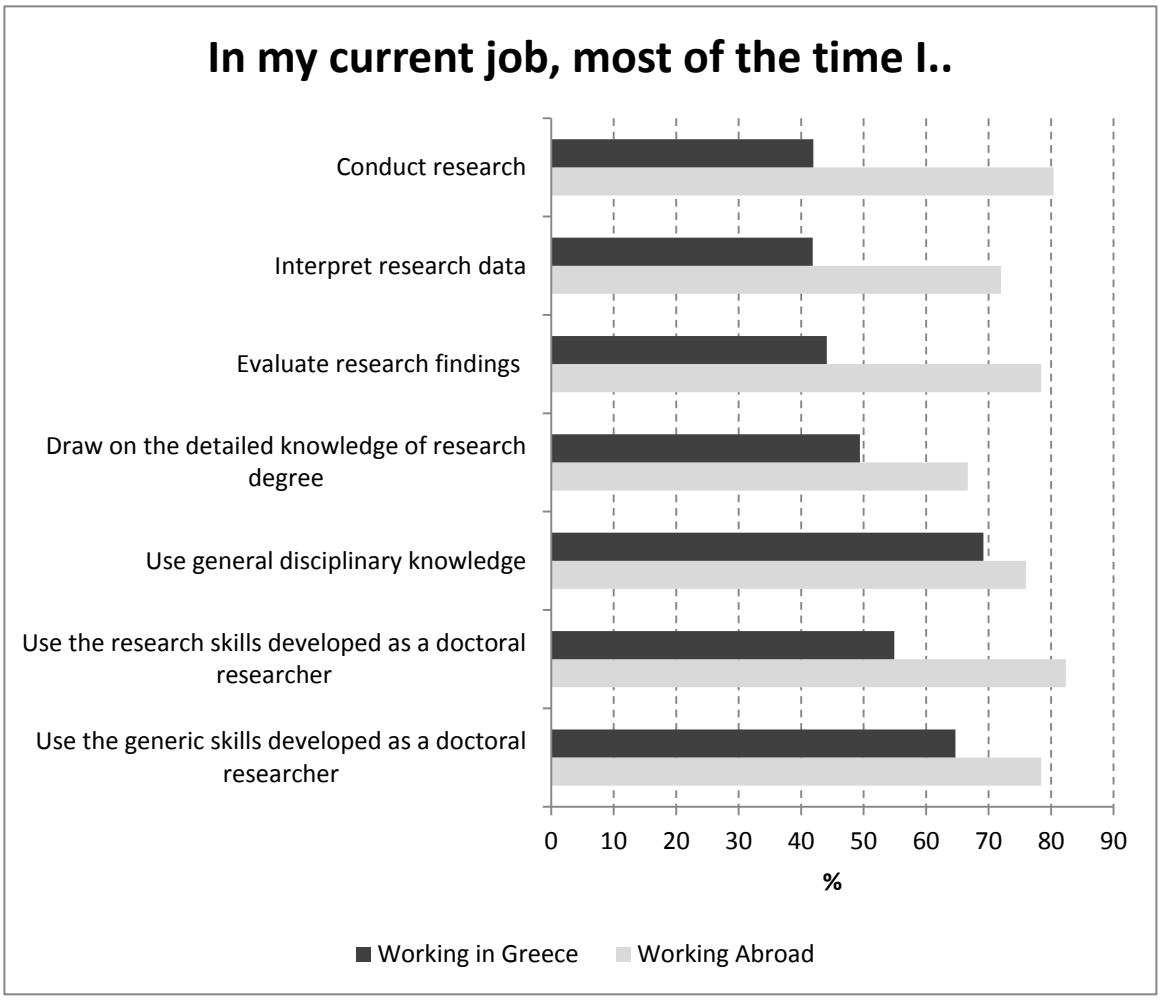


Figure 7-3 shows that participants working abroad had a greater likelihood of undertaking research tasks and using their specialised knowledge (67% versus 50%) in their current employment. This suggests that they were in jobs that better matched their skills and knowledge compared to those employed in Greece. Considering that PhD graduates prioritised more the intrinsic rather than the

extrinsic aspects of employment, it was unsurprising that those working abroad were more satisfied with their careers, reflecting the low likelihood of the latter in utilising their knowledge and skills in their employment.

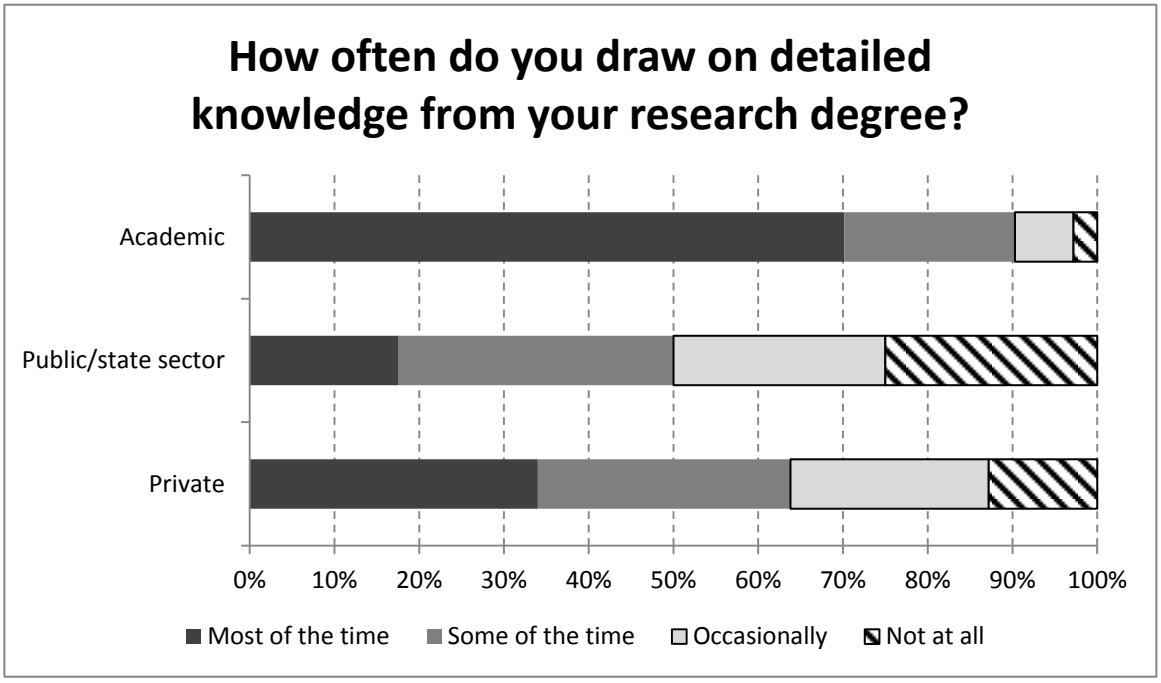
Figure 7-3 Use of skills and knowledge most of the time at work by country of employment



The use of detailed PhD knowledge in current employment differed substantially among various sectors. As expected, study participants in academic posts used their detailed knowledge than in other types of employment.

However, respondents working in the private sector were using their PhD knowledge more often in their jobs than those in the public sector.

Figure 7-4 Use of detailed knowledge of PhD at current employment by sector



Considering the country of doctoral education, foreign-educated respondents working in Greece were the least likely to be using this specific knowledge in their job with almost 50% reporting occasional or no use. The doctorate had not been as valuable in non-academic occupations since it was less often a prerequisite, and doctoral skills and knowledge were less often utilised in the workplace. On all dimensions, doctoral education appeared to be less effectively utilised by those in the Greek labour market as Table 7.2. shows.

Table 7.2 Role of the PhD by country of employment

Role of the PhD		
	Working in Greece	**Working abroad**
PhD for getting current job	45.5% PhD= formal requirement	76.5% PhD= formal requirement
Subject studied for getting current job	44.1% was formal requirement	60.8% was formal requirement
PhD enabling to a great extent to progress towards your long term career aspirations	31.4%	54.9%
PhD enabling to enhance the quality of life generally to a great extent	29.2%	47.1%
Obtaining a doctorate has met my expectations in relation to contributing to my career a great extent	47.4% completely agree or agree	73.5% completely agree or agree

However, these findings can only be regarded as indicative of the need for further research, due to the small subgroups[179] .

7.2.3 PhD experience and benefits for the workplace : advanced skills

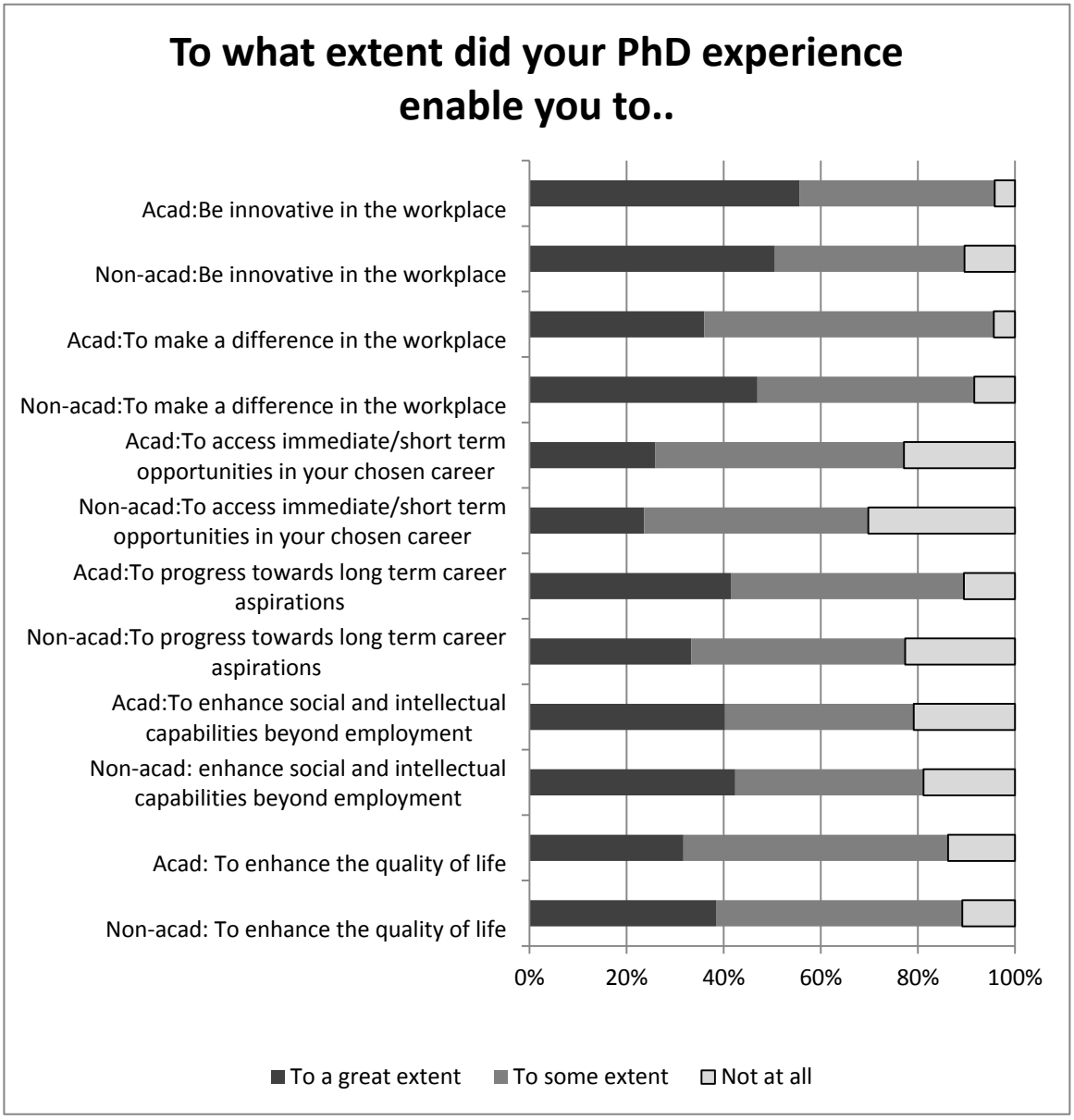
Previous research has also looked at the added value of the PhD in the workplace (Casey, 2009).PhD graduates in this study, provided examples of how their doctoral experience enabled them to contribute towards their workplace. No marked differences between the different sectors were observed.

Nevertheless, participants in non-academic employment were more likely to report that the PhD had enabled them to make a difference in the workplace than their

[179] While these subgroups are quite small in number, it was decided to report the differences between them because they were quite notable.

counterparts in academia. This might be due to large proportion of doctorate holders in academia.

Figure 7-5 PhD enabling at current employment by type of employer



In contrast, in non-academic employment where a more diversified workforce in terms of qualification levels can be expected, the PhD experience was perceived

as added value in distinguishing oneself from colleagues. Respondents in the non-academic sector reported the development of advanced skills during the PhD, such as problem solving (see examples below), critical thinking, and thinking in depth and from different angles and perspectives. They also highlighted the new techniques/methods from the PhD and the independent working.

For example, Gr14, worked in a Greek Ministry and stated how the PhD had helped him to be more critical and researching issues in more depth compared to non-PhD graduates:

> *Interviewer: "You mentioned that your PhD experience enabled you to make the difference in the workplace to a great extent."*
>
> *Phdg14: "This has more to do with my work at the Ministry.. [] in the way of thinking and the utilisation of resources.."*
>
> *Interviewer: "So, what was different, could you give me an example?"*
>
> *Phdg14: "For example, in the inspections I did not stay at the surface of things. It was important to understand the meaning, and the thing you are inspecting and not go only by the book."*
>
> *Interviewer: "Did you see any difference between colleagues without a doctorate?"*
>
> *Phdg14: "Yes, possibly yes, they stayed a bit more on the surface, looking more at things by the book."*

[Gr14, male, electrical engineering (microelectronics), Professor of applications, Greece]

Examples of advanced skills were presented by interviewees in the private sector as well. Uk2 worked in a Greek private company in employment related to the broader disciplinary area of his academic studies (electrical, electronic and

information engineering) rather than his PhD subject. He reported how the PhD enabled him to develop problem-solving skills differentiating him from the rest of his colleagues :

> *PhDuk2: "I think that generally among the competences that all PhD graduates have developed is that they are capable in identifying the problem and a satisfactory solution more quickly and more sufficiently than other people. Due to the knowledge and experience, you can find 'work arounds' more quickly and you are capable in assessing the different [solutions] and select the best."*
>
> *Interviewer: "You said that the PhD enabled you to make the difference in the workplace to a great extent."*
>
> *Phduk2: "It might sound egoistical but I feel it very intensely."*
>
> *Interviewer: "Could you give me an example?"*
>
> *Phduk2: "Firstly, when a new project arrives, ok? It has to do with how quickly my brain solves it and then I just consider it boring because since I solved it, well I just need to implement it now […] I think that I can solve such puzzles more quickly compared to other people, estimating parameters that others are not aware of […] and I can answer that this is the best because I have spent 10 years in experiments, right?"*

[Uk2, male, computer and electrical engineering, product manager, private company, Greece]

A similar argument was presented by Uk4 who worked as a consultant in a multinational management consultancy in Greece. She highlighted how her experience as a scientist enabled her to offer a fresh perspective, a thinking approach outside 'business moulds' discerning her from her MBA colleagues:

> *"When you do business in this company and you could have MBA the fact that I don't have any business knowledge, means that I haven't been in a mould [standard MBA] that I have to think like this. I think completely freely. For example, the reasons that they hire people like me [with PhD in non-business areas] in these companies is that if they recruited only people with MBA, they all think in an x way to solve a y problem. Sometimes, you have to be more open-minded because you haven't been in the MBA mould with 'Porter's Five Forces'*

etc. And this is the innovativeness […] I have learnt to think differently to solve problems and until recently I was solving scientific and not business problems. This ability along with my data analysis and how to make sense of the data, I bring it at work with a slightly different angle."

[Uk4, female, biological sciences, management consultant, foreign multinational, Greece]

Through these examples, the benefits of doctoral experience were translated into an advanced set of transferrable and personal skills, which distinguished PhD graduates from their colleagues without a doctorate. Of course, these are based on personal perceptions and interpretations of the participants. However, it is still demonstrated that PhD holders provided added value to their workplace . As emphasised in the previous example, some employers recognised the benefits of this highly skilled workforce in diversifying its personnel and creating a competitive advantage.

However, further research should be undertaken to explore the value of the PhD in the workplace including not only the self-perceptions of the PhD graduates – employees themselves, but also the views of their colleagues, their line managers and their recruiters.

7.2.4 Findings from the interviews

The quantitative data analysis provided a general picture of the respondents while the retrospective in-depth accounts of the participants enabled an understanding of their interpretation of the value of the PhD. The impact of the PhD in terms of its positive and negative impact was then investigated, together with what was the most significant benefit of having the opportunity to undertake a PhD.

Positive impact

Overall, more comments concentrated on the positive impact of the PhD: the social impact, professional development and personal development. The social impact had two aspects: the social status obtained due to PhD title; and the life-changing relationships fostered during their doctoral studies. The high social status of being a PhD graduate in Greece was emphasised by many participants who reported that the PhD was leading to favourable attitudes of people. Two examples are provided below:

> *"It had especially [an influence] in how people reacted to a PhD in general. For example in Greece I think that it has some reciprocation in general, when somebody hears that you have completed a PhD he might see you in a different way."*

[Gr2, male, electrical and computer engineering, Senior IT consultant, Greece]

> *"For example in some social circles, I believe it is considered as an advantage, let's say as social status […] when they introduce you somewhere, it is mentioned that you have also done this."*

[Gr7, male, electrical and computer engineering, deputy director (telecommunications), Greece]

The social status of PhD graduates appeared to be strong in societal terms concentrating attention and recognition from other people. Others noted how the PhD was part of their identity.

The status of the PhD graduates was also used in professional workplaces especially in consultancy jobs. An interviewee working as a consultant in a multinational management consultancy firm (Uk4) described how the diversified workforce of the company – including many PhD graduates – was considering a

selling point:

> *"This is what they sell to the clients that we will come there with fresh ideas, fresh brains, with a different way of thinking, that they [consultants] are scientists, they come from different backgrounds and they will see the problem from an external, a different point of view how to confront it. For example, when I go and say to a client I have a PhD in Biology or whatever, the client is thinking wow, he/she must have brains, super, fantastic, let's see what he/she will advise us. This is how they see it and I might work on HR at telecommunications sector but the client will think that if he/she has completed it she must be super smart, she will nail the problem."*
>
> **[Uk4, female, biological and physical sciences, management consultant, Greece]**

Therefore, the social status of the PhD graduates was not restricted to the immediate social sphere of the holders but sometimes empowered their professional standing, leading to appreciation and recognition.

Interviewees also considered the doctorate as a life changing experience through the personal and professional relationships they formed during this extensive period of time. Respondents reported that due to the PhD, they met friends – especially within academia – partners, supervisors and colleagues who made a significant impression on their life.

Apart from the status attached to the title of doctor, other beneficial aspects of doctoral education were identified for personal development linked to professional progression. The doctorate was appreciated as a means to broaden labour market opportunities since it *'opened new doors, new research horizons'* but was also acknowledged as a competitive advantage which enabled respondents to access employment more easily. Therefore, some respondents highlighted the

importance of the PhD for getting a job they found both pleasing and satisfying. As they reported, the most significant benefit of the PhD was considered to be *'doing the work I really want'* and enjoying their everyday working life.

Furthermore, as discussed later in chapter nine and demonstrated in previous research, respondents recognised that transferrable skills were developed as part of doctoral education (Nerad and Cerny, 1999). A range of personal and generic skills were reported as a valuable outcome of the doctorate, such as analytical and critical thinking, collaboration and communication skills, perseverance and persistence, but also becoming methodical and well organised. The effect of the advancement of these skills was conveyed not only in their workplaces, but in their everyday life, as illustrated below by Gr1 where the PhD gave him the 'germ of organisation':

> *"You think a bit differently. For example, you have to do the most trivial bureaucratic task. You are told to collect five papers, to staple them and put them in a folder, right? Often, everybody would just do whatever he/she has been told to do. So what you do essentially is to find the steps that will optimise the procedure in order to have the best result in the least possible time. Thus, the first you have to do is to organise, to decide on the procedure that is more convenient [...] You can evaluate during the process."*
>
> **[Gr1, male, chemical engineering, scientific associate, higher education institution, Greece]**

He also mentioned undertaking very careful research even when deciding a family purchase, being well organised in how he completed his market research. Similarly, a female UK-educated participant referred to her tendency to constantly evaluate recurrent procedures in her experimentation work in order to improve efficiency and effectiveness of her tasks.

Increasing self-awareness and maturity were also indicated as in previous studies (Rudd, 1986[180]), while many participants used metaphors reflecting the high significance and the tremendous effort invested in such an achievement. Thus, the doctorate was compared to a big personal bet, climbing a mountain, a trip to Ithaca or a psychological adventure such as a soap opera with dramatic peaks.

Negative impact of the PhD

Two negative aspects of the doctorate were identified by the interviewees which affected not only the period during the PhD, but had implications for their life after their studies. Several reported lack of free time, personal and social life in general as negative consequences of doctoral studies. During the period of doctoral study, some found themselves immersed in their own research, communicating and socialising mostly with their colleagues in their closed research environment without leisure time spent on non-PhD activities. Gr6, with a PhD in electrical and computer engineering mentioned:

> *"Everybody was telling me at the time, when are you going to complete your PhD to finally see you for a bit?"*
>
> **[Gr 6, female, computer and electrical engineering, postdoc, HEI, Greece]**

Interviewees in this study were working long hours, weekends and were 'obsessed', to some extent, with what they would do next in their research. For

[180] In the 1980s, Rudd (1986) undertook a study of graduates in science and engineering from eight UK universities (with first and higher degrees: PhDs and higher degrees in engineering) exploring the value of the PhD. In the sample, higher degree graduates reported that they got substantial gains from their higher degree study in terms of self-confidence in comparison to the first degree graduates.

some PhD graduates in this study undertaking experimental research, sustained physical presence was required at a lab coupled with a demanding timetable, e.g. Uk7 with a PhD in plant biology had to monitor plants during cultivation and follow a specific timetable for the purposes of her research project.

Social and intellectual isolation has often been reported as a problem associated with doctoral education, which may have been mitigated recently with the introduction of new structures and organisation of doctoral education [181](Rudd, 1984, 1985; Delamont and Eggleston, 1983).

Another negative impact reported, was the tension between career development and personal attachments. Gill (2005) raised this issue in discussing the mobility of Italian scientists who had been in the UK and considered returning to Italy. Comparable to Gill's research, PhD graduates in this study commented on home attachments including being away from their loved ones, their family, friends and relatives but also attachments to location, their local home town and sometimes their country. For most, their decision to stay or move abroad for career reasons was taking them away from personal ties with people or location. This was more pertinent to job related mobility after the PhD than to educational mobility (for example to pursue a PhD in another country). For several, doing a PhD raised their career ambitions, became their 'career mission', affecting their career choices (see section 7.3 on global innovator). The specialised knowledge and

[181] However, this does not apply to Greece where more traditional structures are in place.

high skills acquired through the PhD, together with the interest in their research area often narrowed labour market opportunities of doctorate holders especially when they desired to be employed in a job that would further advance their specialised knowledge. In this case, mobility decisions were 'dictated' by scientific factors that predefined the 'scientific clusters' (Millard, 2005), excellent research centres where these PhD graduates opted for, in order to enhance further their expertise. In this way, they were able to fulfil their research plans or personal aspirations, building up their career and contributing to the scientific community. This tension was exacerbated in the Greek context where apart from the limited opportunities for academic/research careers, Greece was not at the forefront of research and innovation preventing to some extent graduates with aspirations to become renowned scientists.

Other less frequently reported disadvantages included psychological changes depending on the progress and possible accumulated debts.

7.3 The role of the PhD in career paths

After discussing in detail the career paths of the PhD graduates that participated in this study, the variables that affected their career choices and the role of the PhD in various terms, distinct patterns were identified among the career profiles of the interviewees. Taking into account the role of the PhD in the career path and considering the mobility experience (student and job mobility), the sector and country of current employment, the interviewees could be divided into four groups: the global innovator; the Greek academic; the highly-skilled professional; and the

under-employed graduate. At a second stage, other variables were considered to identify patterns between these groups, considering characteristics of doctoral education (HEI choice, role of supervision, funding, motivation). The four different profiles are explained next.

The global innovator

There were nine interviewees falling within this category comprising two women and seven men. In terms of broad disciplinary groups and country of doctoral education, they were almost equally divided. Nevertheless, the engineering doctorates in this group appeared to be very theoretical.

In terms of doctoral education, this group decided to undertake a PhD because they were interested in the subject area or they aspired to follow an academic/research career that was challenging and self-fulfilling. Most of the UK-educated had secured funding from research councils in the UK or institutional awards that were supplemented by self-funding. The Greek-educated were mainly funded by working on EU-funded programmes or through family support. The PhD and often the postdoc supervisor in this group played a vital role in the career choices and paths of the interviewees through providing career advice, using their professional contacts and networks for the benefit of their mentees and protecting them from distracting activities during the PhD (this applies mainly for the Greek-educated). Funding, reputation, supervisor and PhD topic were the main reasons behind the choice of institution for doctoral studies. The Greek-educated participants in this group stressed the importance of the supervisor, the location

and the previous study experience in the institution as facilitators towards remaining in Greece for doctoral studies rather than going abroad.

The majority were working in academic and research institutions abroad and had followed linear career paths with completing all their higher education studies consecutively, pursuing their first job only after the PhD. Two cases in this group (Gr3, Uk5[182]) were not working in HEIs but they performed similar tasks to researchers in non-academic settings. For example, Gr3 worked as a member of the research staff in a multinational company conducting research which was undertaken in academic institutions and supervising postgraduate students in universities affiliated to his company department. In addition, Uk5 was a manager in a hospital trust undertaking research on virology, analysing complex virus samples of patients exploring the interaction of different viruses in the same organism.

In this group, career paths were comprised of fixed-term contracts of 2-3 years and there was high institutional and geographical mobility between career posts. The doctorate was a formal requirement for the current job where they did substantial use of their PhD specialized knowledge.

The global character of this group was evident by their high mobility either as a student and/or later in their career. This group had high career aspirations that

[182] Gr3 was working as a research staff member in a multinational company while uk5 was working in a public sector hospital as a manager. Both were undertaking research relevant to their PhD subject, interpreted data and used their specialised knowledge from the PhD.

were guided by the desire to carry on working on the PhD subject area and utilise the skills and knowledge acquired during their doctoral studies. For some, the PhD was determining a career mission for them, requiring them to take career steps that would enable them to fulfil their research agenda and get the returns invested in this long period of higher education studies. This 'career mission' sometimes narrowed their employment options 'dictating' geographical mobility to 'scientific clusters' that allowed the continuation of research in specialised field and ensured the necessary quality to achieve personal research goals. Gill (2005) raised the importance of scientific clustering as a significant factor in mobility and location decisions, directing the career choices in environments that allowed scientists to work with the best in specialised research topics. According to studies on the mobility of scientists (Ackers, 2001; Gill, 2005; Millard, 2005) scientific clustering plays a significant role in mobility especially in countries where systemic conditions were not favourable such as Greece, highlighted also by the participants in a European study. Millard (2005, p.352) specifically noted the reasons for scientific mobility:

> *"Reasons for leaving countries such as Italy, Spain and Greece included under-funding of science, bureaucratic career structures and lack of openness and transparency in recruitment in terms of scientific mobility and the emergence of clusters of R&D."*

The majority of these cases enjoyed job satisfaction in their current employment roles (they loved going to work, learning new things, challenging tasks, being independent and undertaking interesting and various activities) and often went through many hurdles to pursue these careers.

Global innovator: Gr13

Gr3 was a high calibre student in secondary education during which he was offered undergraduate scholarships by American universities. While his family prevented him from going abroad due to his young age, he had always considered going to the US much later. Due to his high marks in the matriculation exams, he was successful in enrolling in one of the prestigious schools of computer and electrical engineering in Greece. He completed his undergraduate and postgraduate education in the same department consecutively, without a gap. During his first degree, he was inspired by a Greek professor and his research specialism [who had just returned from US]. He soon decided that he wanted to explore further this subject area and started working with this professor towards the end of his first degree. Although he considered going abroad, he decided to stay, due to favourable conditions. He was able to do good research, his supervisor was committed and spent much time with him and he liked the place where he had stayed for his first and master's degree. During his doctoral studies, he got a Greek scholarship which was complemented by family support and occasional research in EU-funded programmes. This financial support was 'a key to his concentration' enabling him to conduct good quality research.

After completing his PhD, he applied to different American universities for a postdoc. Having met his future wife, they considered universities where they were both accepted (his wife for a Master's). They decided to go to the university where he was able to work with a very prestigious professor in his subject area. As he said, the decision was at her expense because she was accepted for a Masters in an Ivy League university but had not got an offer from them at that time. They both decided to leave US after two years because they did not like the culture and it was far away from Greece. Therefore, he sent a speculative email to a research institute of a multinational company in Europe because it was one of the best places for research in his subject area. Within three days, he had an interview and a vacancy was opened for him. In his current job, he had high research goals which he was able to fulfil in his workplace. He also appreciated the fact that he was able to contribute to wider society through applying his research. He was very satisfied with his career because he utilised his skills and specialised knowledge being able to work in a stimulating research environment (with Nobel Prize winners) but also live in a country with high quality of life. He acknowledged as a negative impact of the PhD his staying away from his close family and friends due to pursuing his career and research aspirations. He would consider returning to Greece if there were the following conditions: "*if I returned to Greece I would do it for a smaller university, one which is now developing in order to be able to contribute to the creation of a better environment preventing it from things that are happening in the wrong way".*

The Greek academic

Comparable to the global careers, this group's career decisions were also defined by the doctorate and the aspiration to undertake academic/research employment, sharing many characteristics with the previous group. However, these interviewees had undertaken their doctoral education in Greek institutions and they had not migrated – apart from short stays – beyond Greece. There were seven interviewees: four women and three men.

They were also intrinsically motivated to undertake doctorate studies and they longed for an academic or research post. They were mainly funded by scholarships and through their participation in European funded programmes. The PhD supervisor role was key to getting postdoctoral positions immediately after their PhD *'as a natural progression'* in the lab or research group where they completed their PhD. Simultaneously, they undertook many temporary research and teaching posts in their institution or other institutions in the region to build up their CV and be eligible for a more permanent academic or research post. All the women in this group continued working in the same unit where they were awarded the PhD. After seven to eight years on average from the PhD completion, they had open-ended contracts. The male participants while they followed similar paths in the early career years, had moved to other HEIs getting permanent posts. Although this group considered mobility during and after their doctoral education, they had stayed in Greece due to existing favourable conditions meeting their study needs. Being able to remain near to friends and family deterred them from

going abroad. Interviewees in this group reported having had opportunities to work in non-academic sectors but rejected them due to their aspirations to progress in academia and use their skills and knowledge in challenging and interesting activities.

The Greek academic: Gr5

Gr5 was a female PhD graduate who completed all her degrees in electrical and computer engineering in a prestigious urban university in Greece. She had cultivated an interest into academic careers from very early in her studies due to her father being an academic in the same university. Her first degree supervisor encouraged her to pursue a topic from her undergraduate dissertation that could be further researched as a PhD topic. Following his advice and because she liked conducting research especially in biomedical engineering, she decided to pursue doctoral studies.

During her doctoral studies, she was able to work in EU programmes and did some teaching for supporting her studies. Although she considered going abroad for postgraduate studies, she decided to complete a doctorate in the same institution since there '*were signs for good research to be undertaken'* and going to US (her alternative) would require staying abroad for a substantial period of time. The role of her supervisor was significant not only in securing funding and enabling her to work in a great range of European projects during her doctoral studies but also later in her career. When she completed her doctorate, her supervisor proposed her to do a postdoc in the same lab, which came *'as a natural progression'*.

Until the time of the survey, she carried on working as a researcher in the same research unit in the same university. While for the first seven years she was working as self-employed working on a project basis, in 2010 she gained a post in the research institution as an employee with an open-ended contract. She had also considered going abroad for a postdoc with her husband (a PhD graduate), but they decided to stay in Greece and had a family with the support of their parents.

Although she would like to access the tenure track academic ladder, she acknowledged the limited academic vacancies and the difficulty of becoming an academic in Greece. At the same time, due to her family commitments (a mother of two children) she was unable to compete for posts beyond the region she lived, preventing her career progression to some extent. She was very satisfied with her work, loved conducting research, using her skills and knowledge to undertake research projects with which entail a social contribution as well.

The highly-skilled professional

The highly-skilled professional group used the skills rather than the knowledge acquired through the doctorate. Their priorities were professional rather than research. In terms of discipline, the female participants had a PhD in biological sciences while the male counterparts had completed doctoral studies in engineering. All 'drifted' into the PhD since they first considered undertaking the PhD when favourable conditions were in place to enable them to pursue one. The female participants initially searched for master's, but they were both more interested in a subject area and topic that was investigated through a PhD. All male participants funded their doctoral studies by working in non-university employment. As reflected in their accounts, it was very important for them to combine their doctoral studies with full-time employment outside the university, building up their professional experience. Consequently, among the important reasons in selecting institution were the location and its convenience in facilitating work and study simultaneously. Their career paths reflected the significance that these participants attributed to combining their higher education studies with work experiences between or during their studies. On the contrary, women in this group finished their studies and then searched for employment.

The supervisor's role was marginal in the career paths of this group, often mentioned in relation to the doctoral degree rather than their career choices.

This group included UK and Greek-educated working both in Greece and abroad. The majority were occupied in the private sector, occupying consultancy and

managerial posts which were well paid. The PhD was important or helpful for their current job but the specialised knowledge was not often used in their employment. The limited number of academic posts, the difficulty of pursuing an academic career in Greece and the limited R&D sector in Greece had prevented some participants of this group to fulfil their career aspirations. So, they had adjusted their professional orientation to career paths where the PhD would not be fully utilised.

In this group, the PhD was translated as a competitive advantage in comparison to non-PhD graduates in the workplace, attributing an advanced set of skills, such as problem solving, critical and analytical thinking but also personal skills such as discipline, independence, persistence and precision that distinguished them from less qualified employees. Personality also played a role in this group since it was evident that most were empiricists, had a practical orientation to things and often were very strategic in broadening their career decisions.

The highly-skilled professional: Uk2

Uk2 was a male PhD graduate with an educational background in electrical and computer engineering. He had completed his first degree in a Technological Institution in Athens and his postgraduate studies in a UK institution. Since he was 15 years old, he had been working with computers. After his undergraduate degree, he decided to do a Master's due to his high ability and his interest into further knowledge. Despite having offers from UK professors to pursue a doctorate, he was convinced to return to Greece, undertake his military service and go out in the labour market since he prioritised professional experience over a PhD. Just before leaving for Greece, a professor proposed him an industry oriented doctorate which combined work experience (in a company) and PhD studies. His tuition fees for the PhD were thus funded by the university while the company was provided a monthly scholarship for living costs. He was thus drifted into a PhD into the same institution where he did his Master's.

After the PhD, he carried on working in the same company but on full time basis. He was soon promoted to a senior post supervising PhD candidates under the same agreement as he had. During and after his PhD, he taught at his university.

After a couple of years he returned to Greece due to lifestyle and social reasons. During his military service, he searched for jobs using personal and professional contacts. He soon found a job as a Senior Software Engineer – and was then promoted to Product Manager – in a private company through a friend. This job did not require a PhD and in his opinion, it was his previous working experience and his professional experience abroad that played an important role rather than the PhD itself. Although he was not utilising his specialised knowledge in this job, he was using research and transferrable skills developed during his doctorate that distinguished him from his colleagues. Due to his interest in completing challenging projects, he was also self-employed as a consultant.

He had considered working as an academic in the UK but not in Greece. He was discouraged from pursuing an academic career in Greek institutions when he realised that networks and politics were very important. He thought that the private sector in Greece was more satisfying in extrinsic aspects (more meritocratic culture, better salary) but less so in intrinsic aspects such as utilising PhD specialised knowledge, flexibility and autonomy to experiment with new things.

The under-employed graduate

Only one woman and two men were included in this group. There were no patterns identified in terms of country of doctoral education or discipline, but they all worked in Greece. The doctorate had been a competitive advantage in relation to less qualified applicants in order to get a graduate level job that did not really require their PhD expertise. Two cases were in permanent public sector employment and one in the private sector working with an open-ended contract. However, all started their career paths in the academic sector after completing their PhD (they did not undertake any work experience during their studies), following temporary research and/or teaching posts in Greek higher education and research institutions. The insecurity of these posts in their early career paths led them to inter-sectoral mobility, accepting employment in non-academic settings where they were not using their PhD specialised knowledge. They were not very satisfied with their career to date and current employment since they were interested in research jobs that would enable them to work on the subject area of their PhD. This group also raised the lack of academic and research posts in Greece and the inability of the Greek private sector to absorb them as contextual factors affecting their career choices. While two of the cases had completed their doctoral studies abroad and the other one had been offered a doctorate abroad, they were all interested in undertaking employment in Greece and they were not considering career mobility.

The under-employed graduate: Uk8

Uk8 was a male PhD graduate with undergraduate and postgraduate education in electrical and computer engineering. He undertook his first degree in a Greek urban university where he developed an interest into research and further study. Limited funding opportunities in Greece led him to a UK institution where he secured a full RCUK scholarship (stipend and fees): *'instead of moving to another Greek city with no money, it was the same thing from an expenses' point of view and I finally decided to go abroad'.* While he did not exclude an academic career, he decided to do a PhD due to the interest in the subject and for personal development.

After the PhD award in the UK, he returned to Greece, undertook his military service and got many temporary teaching and research posts for the next five years in Greek HEIs. In the meantime, he was unsuccessful in applications to the private and academic sector. He alleged research fellowship opportunities in the Greek academic sector were non-existant, preventing early career researchers to follow academic and research career paths. In addition, he referred to the unfavourable conditions of Greek academia such as the 'politics' and their implications for 'outsiders' since some of his well-qualified friends (foreign-educated) could not get a tenure post. *'In Greece, it is much easier (than in the UK) for somebody to progress, just because he/she has stayed for a long time with a professor'.*

In 2009, he got a public sector post after being prompted by his parents. Although he was more interested in research he decided to do this job because '*You do some things as a compromise, for the money only'...* While his current employment did not require a PhD, the qualification provided a competitive advantage giving him extra points in the public competition for the post. Although he did not use his specialised knowledge, he utilised some of the PhD skills (e.g. critical thinking) at the workplace. He liked the extrinsic aspects of his job such as the working hours which enabled him to study and do research on his own initiative.

He reported that if it was not for military service, he would have remained in the UK since he was at the peak of his research activity. Although he considered returning to UK, such a decision would entail staying there for ever.

7.4 Conclusions

This chapter has shown that while the doctorate was a formal requirement of academic employment, it had rarely been required for non-academic jobs. PhD graduates in the latter group were less likely to report using their specialised knowledge and skills in the workplace. This suggests that PhD graduates interested in employment beyond academia find it difficult to secure a post that builds on their PhD knowledge. This raises questions about the demand for this highly skilled workforce in the Greek labour market.

Furthermore, participants working abroad –compared to those working in Greece – were more likely to report being employed in roles that required the doctoral qualification, where they utilised their PhD skills and knowledge. Given the limited academic and research vacancies in Greece and the difficulty of finding PhD-related jobs in non-academic sectors, career mobility abroad appeared to yield positive returns on the PhD investment, on the basis of the evidence reported both in this chapter and the section on job satisfaction.

In less tangible terms, PhD holders identified further benefits of doctoral education beyond acquiring specialised knowledge and advancing academic, transferrable and personal skills and the implications that this had in their career development. Respondents believed that the advanced skills or attributes (different way of thinking, problem solving, and fresh ideas) or the PhD title provided a competitive advantage to its holder distinguishing them from less qualified personnel. The social impact of the PhD and personal development gains such as maturity and

independence were highlighted by the participants. In addition, personal satisfaction in their doctoral achievement, self-awareness and self-actualisation through meeting their professional aspirations and performing self-fulfilling employment roles were also reported as invaluable aspects of pursuing this qualification. On the negative side, the intellectual and social isolation that such a qualification often entail was reported. Their high level commitment in a project for a long time had negative effects on their leisure time and their personal life including the tension that it created between professional development – especially in the academic sector – and personal attachments.

Based on variables that were found to influence careers of PhD graduates and the role of the doctorate, four different career profiles were identified among the respondents: the global innovator with a career mission beyond geographical borders; the Greek academic, satisfied to develop a career within the constraints of the national labour market; the highly-skilled professional who had realised the value of having an advanced set of skills for non-academic professionals; and less satisfied, a minority who were or felt themselves to be under-employed. Through these profiles, it was evident that the importance of the different factors outlined in the previous chapters varied among the career profiles presented. For example, the role of the supervisor has been highlighted in global and Greek academic careers while it has been only marginal in the career paths of the highly-skilled professionals and the under-employed. The latter two groups also highlighted the role of systemic variables in their career choices such as the

limited career prospects in the academic and non-academic sector in Greece for this highly-skilled workforce. This issue will be explored further in the next two chapters.

Chapter 8 LABOUR MARKETS AND CAREER PATHS

8.1 Introduction

So far, education decisions, the role of PhD on career development, early career steps and current employment decisions of study participants have been discussed. This chapter focuses on the contextual considerations beyond individual decision-making that also need to be explored in relation to career choice. Given the levels of specialisation in knowledge and skills, the PhD labour market is likely to be even more segmented than the wider graduate labour market. Thus, national and sectoral labour market characteristics are important parameters of career choices and opportunities for PhD graduates. Academic and non-academic settings in relation to biological sciences and engineering will be explored to see how particular labour market opportunities facilitate or hinder career development and use of doctoral knowledge and skills. In addition, self-employment is explored with a focus on the Greek academic and research sector while gender considerations are discussed in the context of male-dominated engineer profession and dominant presence of female PhD graduates in biological sciences.

8.2 Labour market considerations: discipline and academic/ non-academic sector

Discipline is a critical factor in career choices and development (Nerad and Cerny, 1999; Enders, 2002; Martinelli, 2002). More specifically, Enders (2002) in his longitudinal study of German PhD holders has concluded that discipline, personal

motivations and aspirations, and the career structure of the German employment system determine career options more than doctoral training characteristics. This study also presents similar findings.

Interviewees were asked about labour market opportunities for PhD graduates in their subject area, to explore the influence of contextual considerations on career choice and career paths. It was evident in their accounts that these external factors – beyond their individual control – limited or widened their choices especially in the Greek labour market. Issues encountered included the segmented disciplinary labour markets, the internal market and limited entry of the academic sector, and limited job opportunities for the highly specialised workforce in Greece.

The first section of this chapter investigates the perceptions of the interviewees – PhD graduates and academics – about how the Greek academic system operated particularly the opportunities and challenges of PhD graduates aspiring to academic careers. Then the phenomenon of self-employment in the Greek academic and research sector is investigated in relation to PhD graduates in engineering and biological sciences –the largest subsamples in the study – to demonstrate the precarious conditions of early career experiences in this sector. Next, the labour markets accessible to PhD graduates of these disciplines are presented, focusing on the non-academic opportunities available in Greece. Finally, gender is examined in relation to these disciplinary labour markets, given that men dominate the Greek doctorate holders' population in engineering and

women acquire a high proportion of PhD qualifications in biological sciences compared to any other field in natural sciences.

8.2.1 The Greek academic system

As discussed in chapter three, the Greek higher education system since its origins, has been criticised in terms of its bureaucracy, limited transparency and accountability, dysfunctional framework, strong state control and concentration of power on senior academic posts.

There is a cumbersome and bureaucratic procedure for the recruitment, selection and appointment of academic staff as stipulated in Greek legislation (see Table 3.13).The period between the day of election and selection and the actual appointment of the candidate can be long, due to bureaucratic procedures between the institution and the Ministry. In theory, the law specifies timetable and deadlines for each stage of procedure. In practice, this is far from true. One academic interviewed in this study described the whole process and how easily it could turn into a rather time-consuming process, especially if common strikes or university occupations are considered. As a Dean for his department, he had an extensive experience of 'elections' and was very knowledgeable of the required procedures. The following example illustrated provides a flavour of his account and how, in his view, the Ministry was using delays to save money:

> *"For example, if you apply for an academic post after you complete your PhD and you get elected, well then you have to estimate approximately two years, if you are lucky, to return to Greece or three to four years if there has been misfortune in your appointment[…] If there is a new appointment, the state has*

to pay. Therefore, it was considered that if there is a delay of two years, then we save two years of salary. If at the moment, there are about 500 people to be appointed let's say, then with rough calculations the ministry could save up to 20 million euros. This is the reason."

[Male, professor, peripheral university, natural sciences]

As reported in chapter three, the Greek university system evolved with elitist features, concentrated power in professorial chairs which have been transformed to academic clusters of influence in Greek universities. These clusters have often been accused of nepotism and lack of meritocracy by the media[183], but more often from PhD graduates and academics themselves. Interviews with the latter group have highlighted vagueness of selection criteria and the subsequent manipulations by the members of the committee in order to meet their personal interests rather than select candidates that would benefit the department and the university. One academic with experience in both the US and Greek universities compared the two systems in relation to faculty selection:

"It is different in the US and Greece. In the US, it is about what you know and they are taking a risk in essence…they all think in the same way: "Is there a chance that this person will bring a Nobel Prize?" But of course they know that one 1,000 people they interview might bring them a Nobel Prize. They simply want people that will help the university to progress, to have a good name: if you think of it as a shop, to expand the shop and make it better. In Greece, two thirds of academics don't care about this […] Unfortunately, in Greece there is still a majority of academics who were appointed during the 1980s who will leave soon. For the time being, they hold the majority and they don't care much whether the university will progress or not, they are mostly interested in themselves. This is the big difference. Whereas in the US they care about

[183] An example of such nepotism was made evident in 2010 when it was verified that in the University of Athens, there was a family occupying the main academic posts in the department of social theology. According to the Greek newspaper Kathimerini (23/06/2010), the Dean Eleni Christinaki with her husband, Professor Panagiotis Christinakis had been found liable for not obeying the legal rules about recruitment and selection of personnel, supervising and participating in the election procedures of their family members.

themselves as part of the university. [They recognise that] if the university is not progressing, they don't progress either.Their philosophy is that they will hire somebody who will bring something extra to the university, so that the university will always develop further."

[Male, professor, urban university, natural sciences]

This example does not only illustrate – to some extent – the different recruitment philosophies between the two systems but also suggests that there is not an academic labour market in Greece, as defined by Caplow and McGee (2001). The academic profession has civil service characteristics, with legal frameworks defining personnel procedures and employment conditions. While competition is high for a faculty position in Greek academia, the posts' characteristics are legally regulated in terms of salary and, benefits with no leverage from the individual candidate. In addition, the small size of the higher education system, the civil service nature of the academic profession and the importance of networks prevent Greek academics to moving freely between institutions as it is the case in other academic systems.

The importance of Greek doctoral education – especially in terms of supervisor, networks and contacts developed during the PhD – in embarking on an academic path in Greece was highlighted in section 5.2.4 which provided evidence that the Greek-educated had a smoother transition in the system, progressing 'naturally' into temporary posts that often led to the tenure-track system. Doctoral experience in a Greek department enabled relationships to be established which could prevail over better qualifications that foreign-educated doctoral holders might hold. The completion of a doctoral degree in Greece assisted in developing

a long-term relationship with a professor who often played a critical role in the recruitment process, as well as providing an extensive network of contacts within Greek academia. This enabled graduates to become a member of the 'insider' group. One way for 'outsiders' (foreign-educated) to reverse this disadvantageous position was through establishing their academic career abroad before returning to Greece to get a good post as the following interviewees suggest:

> *"You need to have done many things, to know as many people as you can, to get a post; to have spent 15 years of your life to get the job."*

[Uk4, female, biological sciences, management consultant, Greece]

> *"[Comparing UK with Greece] first of all there is no money for research in Greece and secondly in order to access the system they are completely different in terms of meritocracy and contacts. […] There is no basis for comparison, I am not saying that it does not help to know somebody, but it does not mean [if you don't have contacts] that if you deserve it, you won't manage in UK. In other words, if you are good here, you will succeed. In Greece it is not important how good you are if you don't know anybody, not important at all. Unless you return to Greece with a Nobel [prize] but if you are just a very able individual with potential, they don't care […] I would never return to Greece to build my career, I would only go if I was established and I was able to carry on my career."*

[Uk3, male, biological sciences, postdoc, UK]

As shown in chapter six, UK-educated participants were less likely to be occupied at the time of the survey in academic permanent posts than their Greek-educated counterparts. In their retrospective accounts, UK-educated participants believed that it was better for 'outsiders' PhD graduates to return to Greece in their mid-careers – rather in their early career experience – with a view to 'escape' to some extent from the handicaps of the Greek academic system (lack of meritocracy,

nepotism) which could potentially change their career orientation or hinder their early career development.

It is important to stress that several Greek-educated PhD graduates by contrast, identified difficulties in pursuing an academic career in Greece although being 'insiders' in the system. They stressed the significance of structural factors and correct timing. Individual performance and achievement might just not be 'enough' to get an academic post in Greece. Their cynicism and fatalism are apparent:

> *Gr4: "From public relations, to personal interests, there are various things that come in, informally they come in of course, but they do play a role. [...] to have a good CV and of course the creation of the right opportunity."*

> *Gr8: "There are few posts but many candidates and high competition […] there is no meritocracy in Greece, it is known after all [...] and of course luck, to be at the right time, at the right place."*

A Greek-educated interviewee working abroad also highlighted the importance of the supervisor but also the knowledge of how the system works, which foreign-educated applicants for doctoral posts might not have been aware of:

> *"Academically it is difficult in Greece if you are not close to a professor who has contacts in your school. In other words, the professor has to be a big name and have great influence. It is very difficult. Having experience of 2-3 years abroad counts a lot. Unless you are the puppet of somebody and he promotes you […] In this case, even if you have experience from abroad, the 'local' will get the post [...] The students who did their undergraduate in Greece and then went abroad do not know the system. Only if you complete a postgraduate degree in Greece you learn how things work and how they are organised."*

[Gr3, computer engineering and informatics, research staff member, Switzerland].

He also described his experience of attending – as student representative –

in a lecturer's election process. There were two candidates, each supported by a different group of academics demonstrating '*zero meritocracy and pure nepotism on its peak'* since the selection of the candidate was not based on the competences and potential contribution to the department but on their networks.

Similar to foreign-educated PhDs, two Greek-educated interviewees reported that the realisation of the difficulty to access an academic post despite their initial academic career aspirations was one of the reasons for changing their career orientation. Facilitated by working in the private sector during their doctoral studies they progressed in the non-academic sector.

The lack of meritocracy and the dependence of career progression on networks, the academic conflict between groups, the low payment and the insecurity of academia were recurrently commented as disadvantages of working in academia by the interviewees. Unsurprisingly, those who were exposed to academic labour markets abroad were also likely to comment on low salaries and insecurity in the Greek academic posts. Those working in the non-academic sector emphasised the increasing importance of contacts in academia, while they considered that in the private sector, the career development processes were more meritocratic, based on levels of competence and hard work.

Irrespective of where they had studied, interviewees also stressed the lack of early academic posts such as postdocs and research fellows' positions in Greece. These enable PhD graduates to carry on their research and acquire experience of a smoother transition into the labour market. As discussed in chapter thee, only

EU programmes have provided temporarily such opportunities since there is not a national research fund to ensure the continuity and sustainability of financial support for such a purpose. This is also demonstrated by the precarious conditions and phenomenon of self-employment of PhD graduates in their early career building experience inside the Greek academic sector, is presented next.

8.2.2 The Greek academic and research sector and self-employment

According to the survey responses, more than half of self-employed respondents were working at a HEI or an academic research institute. Looking closely at the subsample of self-employed respondents, it appeared that most were working as research associates, scientific associates or postdoctoral researchers. The majority had a first degree in engineering.

Table 8.1 Current employment sector by type of organisation

Type of organisation	Employment status			
	Employed full time	Employed part time	Self-employed/ freelance	**Total**
HEI	88	11	14	**113**
Research Institute	29	2	5	**36**
Public service	28	0	0	**28**
Multinational	18	0	2	**20**
Private enterprise	15	0	11	**26**
State enterprise	9	0	3	**12**
Private non for profit institution	1	1	0	**2**
Total	**188**	**14**	**35**	**237**

Qualified engineers can work in universities, research institutes and the private sector on a self-employed basis, which has financial benefits such as reduced tax and the ability to work in different projects and sectors as they wish. The main disadvantage of this employment is the increasing insecurity which can be a reason for disillusionment and mobility to other work (NTUA, 2000, p.37).

One interviewee worked as a researcher in an engineering research centre – belonging to a university – for eight years after the completion of her doctorate. It was not until recently that she became a researcher 'officially'. For seven years she was employed on projects with the 'mplokaki'[184] , and so her salary was dependent on the hours worked.

> *Interviewer: "I have heard about the 'mplokaki'. Does it entail advantages for you?"*
>
> *Gr5: "Look, 'mplokaki' clearly entails advantages, it has less restrictions. But, simply in terms of academic career, the official title of researcher helps, and this is why I did it."*
>
> *Interviewer: "Less restrictions in terms of what?"*
>
> *Gr5: "Because now for example [that I am employed by the university] the salary is specific. It might be more regular than when you are with 'mplokaki' but the money might be of course less than when you are with 'mplokaki'. Because as self-employed, nobody tells me when, how, which hours and in how many projects I can work on. While now that I am an employee, I have to work eight hours, it is everywhere the same, so I have well defined restrictions."*

Self-employment was also evident in cases of PhD graduates in biological sciences providing independent research services to Greek research institutes.

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[184] In English 'mplokaki' is translated as notepad. In Greek it is used as a receipt for the provision of independent services which is given to the employer and the tax system)

One was offered – but did not accept – a post in a research institute where the tasks, timetable and payment schedule were unclear (Uk7). A female interviewee found herself working in a Greek research institute after her PhD and postdoc from a prestigious UK university (Uk4). She worked there for a few months as self-employed, paid 400 euros per month until she found a job in the private sector as a consultant. She did not want to stay longer due to the poor infrastructure of the research institute – compared to the UK labs – and the poor career prospects.

PhD graduates from Biological sciences in the academic research sector reported a different picture to other disciplines especially in terms of the discipline's 'stagnant' career paths. Research in the US showed that PhD graduates in biology needed to undertake more postdocs than their counterparts in engineering or physical sciences in order to access a tenure track post (Nerad and Cerny, 2002). Consequently, PhD holders often had to complete 3-4 postdocs of 1.5-2 years each, getting a tenure-track post – if they were lucky – later in life compared to others in non-biological sciences. Robin and Cahuzak (2004) concluded that the effect of the postdoc – although a temporary position – was a positive 'stepping stone' especially for those oriented towards an academic career. However, the temporary character of these posts can prevent PhD graduates from remaining in the academic and research sector. In Greece, biologists in research centres work on a project basis as self-employed, on temporary projects lasting about 3 months, which adds pressure and enhances the feeling of uncertainty and

job insecurity for some early career researchers. Interviewees in biological sciences also described similar career experiences with temporary projects and postdocs after the PhD (see Uk9, section 6.2.2). Uk9 was a foreign-educated returnee to Greece who decided to work in the private sector in a graduate job, due to the high insecurity and risk entailed in her work.

It was evident that the prospects and the conditions in academic and research careers were not very promising. Thus the next section explores the non-academic opportunities that PhD graduates from biological sciences and engineering have in the Greek labour market.

8.2.3 Disciplinary labour market: Engineers

Engineering had always a prestigious role in the Greek labour market. In the 1960-70s, the engineering profession reached its peak providing guaranteed employment and social status. Today, engineering graduates in Greece still enjoy favourable conditions with a smooth transition to the labour market and access to highly paid and responsible jobs (NTUA, 2000; Karamessini, 2008). The National Technical University of Athens (NTUA) is the oldest technical institution and one of the most prestigious Greek universities, covering 40% of the engineering graduate population working in Greece. According to NTUA research, engineering in Greece is still a male dominated profession despite the increasing participation of women in engineering. Engineering graduates are predominantly highly educated and from higher socio-economic backgrounds (NTUA, 2007). An increasing proportion of engineers pursued postgraduate studies between 1971-

2006 (16.2% in 1971-75, to 53.4% in 2001-2005) (TEE, 2009)[185] . While more engineers completed postgraduate degrees in Greece in the last decade (25% in 1997 to 55% in 2009), a decreasing trend of exporting engineering graduates abroad can be observed with numbers almost being halved (76% in 1997 to 43% in 2009)[186]. The UK is still the most preferred country for postgraduate studies (59% of total foreign-educated postgraduates). Motivations for postgraduate studies are found to be mainly scientific interest or the enhancement of professional prospects and not the difficulty of finding a job (ibid, p.15). Previous research has suggested that while the Master's degree was found to have positive effect on the earnings of engineers, the doctorate seemed to have had a slightly negative effect on the earnings (NTUA, 2000).

In terms of specialism, electrical engineers demonstrate a greater tendency for postgraduate studies both in Greece and the UK (NTUA, 2007, TEE, 2009). Furthermore, electrical engineers have always been in great demand (ibid,). It is among the most male dominated specialism compared to other engineering areas (84.3% versus 40-66%[187]) (ibid, p.54). In a recent study, electrical engineers were mainly working in the public sector as civil servants (33.3%) or employees with permanent/open-ended contract in the private sector (31.9%) (TEE, 2007).

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[185] The increasing proportion of postgraduate degrees can also be attributed to the introduction of postgraduate education (Master's programmes) in 1992 in Greek universities.
[186] According to a study by NTUA (2007,p.15) although the number of exporting postgraduates has fallen, there are still many graduates who prefer to undertake postgraduate studies abroad, especially those from higher socioeconomic backgrounds.
[187]For example, male engineers are represented in the following percentage: Architects 40.5%; civil engineers 66.7%; chemical engineers 61.4%.

Furthermore, electrical engineers comprised the highest proportion – among engineering specialisms – working in public education and research institutes (15.9%).

Engineering graduates in this study were more likely to acquire professional experience after the first degree and/or during the PhD as independent/self-employed – as shown in following section – providing consulting services or as a supervisor engineer. These activities enhanced the access and non-academic labour market opportunities to the doctoral graduates post-PhD, which explain to some extent why they were also found in this study more frequently in non-academic paths in comparison with their counterparts from other disciplines.

Moreover, respondents with engineering degrees reported that they could access a wide range of different occupations in various sectors even without a doctorate. Electrical engineers indicated that they could work in the utilities' sector, telecommunications, informatics and computer science sectors. In addition, these graduates have the option of becoming teachers in secondary education.

The enhanced career prospects that engineers enjoy in the Greek labour market is apparent from the comment that follows:

> *Uk8: "You should know that electrical engineers are in a favourable position [in the Greek labour market] because we have many contacts in the technical chamber which has provided greater accessibility in a range of sectors."*

Of course these opportunities were available to all electrical engineers and not just PhD graduates. In this case, the PhD was not required, but it provided a competitive advantage to those that had it. As the previous interviewee put it:

> *"[the PhD] is just increasing the possibilities to get the job when there are many applicants, this is it"*
>
> **[Uk8, male, electrical and computer engineering, electrical engineer, public sector Greece]**

Engineering schools and more specifically electrical engineering schools were able to safeguard European projects where PhD candidates could be integrated and financially support their studies. Evidence also revealed cases of Physics' graduates moving to engineering schools for their doctorate due to the greater availability of doctoral funding and the links between these fields as illustrated below:

> *"engineering schools attract European programmes (grants) so they can support scholarships. The physics department had a master's programme on digital electronics that I liked, but it could not support a scholarship [...] Basically you don't really know what you want to do. You depend on the availability of PhD topics […] Firstly I went to a professor in mechanical engineering whom I knew. He didn't have a topic at the time but he referred me to other professors. They referred me to another well-known professor who had topics and programmes in chemical engineering […] I got interested in them and thus I started."*

In addition, he explained how such a decision also entailed benefits in broadening future career prospects due to the high employability of engineering compared to physics in the Greek labour market:

> *"Look, as a physicist you cannot access easily the labour market. You need to start working in private tuition schools or to go through the public competition for secondary education. One alternative, as a friend of mine did, was work at a software company or go abroad to do a Master's in economics."*

[Gr1, male, chemical engineering, scientific associate, higher education institution, Greece]

However, the same respondent described how his labour market opportunities continued to be limited due to his first degree. Although he completed his doctorate in chemical engineering, he could not register as a member of the Technical Chamber of Greece, which restricted his access to available opportunities for electrical engineers. Therefore, when he was asked about the job opportunities for PhD graduates in his subject area, he made a differentiation between him and an engineer with a PhD highlighting the importance of the first degree in engineering.

> *"I am not considered an engineer in Greece. Maybe in England or US I am considered an engineer or the PhD characterises me, but for Greece I am not perceived as an engineer [...] I cannot be a member of the professional association for engineers in Greece while an engineer can go to any company, factory, can undertake his own projects, sign and do all the things that engineers do. Now, for a non-engineer, things are very limited, he can only go to a big company which has R&D, right? There are not many like this in Greece and often they do not pay well.*

It was suggested that physics' graduates[188] were in a disadvantageous position in comparison to their engineering counterparts, in terms of funding provisions for postgraduate study and labour market opportunities. Consequently, physics' graduates considered a doctorate in engineering, facilitated by the links between physics and engineering. Nonetheless, disciplinary and occupational identity seemed to be mainly determined by their first degree with the doctorate having no

[188]Karamessini (2008) has reported in a national study of graduates from Greek universities that graduates in physics, chemistry and maths have low earnings and high rate of mis-employment. In addition, almost half of the graduates in the study indicated that there were negative employment prospects.

real effect. In addition, the strong identity of the engineers, with the accompanied privileges it entailed, seemed to be rather well protected in Greece excluding PhD graduates without undergraduate engineering credentials, despite their highly specialised engineering knowledge.

Apart from the broad disciplinary field, specialised subject areas and PhD topics also had an impact on the availability of PhD employment opportunities particularly in relation to Greek economy trends. Interviewees highlighted the emergence of telecommunications sector in Greece during the period of their doctoral education. A wide range of opportunities and a high demand for electrical engineers are illustrated in the accounts below:

> *"There was a period, like a golden era [...] 1997-2000 was the golden era for telecommunications since a new market in essence opened.. This was not only for me, as a company we were then looking for graduates in this area and hired anyone we found. Nowadays, things are much worse, there are no new vacancies for new graduates making things really difficult. And there is a high number of graduates now, probably a result of this golden era as new departments in these areas were developed... The trend is exactly the opposite, there is a very big supply of graduates while the demand is very low in the country, worse than ever […] This golden era lasted until 2002, then it gradually started deteriorating and since 2006-07 it has been very difficult."*

[Gr7, male, electrical and computer engineering, deputy director (telecommunications), Greece]

> *"During that time […] , there was a high demand for electrical engineers, for project management, and mainly for mobile telecommunications (and software), it was a buzzing sector. For example, I know nobody from my cohort that that was not hired immediately, irrespective of having a postgraduate degree, mainly graduates after their first degree. [...] The ones who had a PhD found good posts in relation to project management […] in addition, many PhD graduates in engineering were hired in specialised scientific personnel posts in the public sector, in good posts such as in the National Committee for telecommunications, in ministries etc. […] Especially for the ones who went initially to these posts, it was not difficult. For example, if the post was relevant, they had the expertise and the PhD from the university x helped them, this is what I saw. Nowadays, the situation is very difficult, it is very uncertain because everything is so volatile."*

[gr5, female, electrical and computer engineering (biomedical engineering), university researcher, Greece]

Both examples highlight the key role of sectoral trends in employment opportunities such as the emergence of telecommunications in Greece which created a new market for engineering graduates. In this case, the PhD appeared to be a competitive advantage for accessing senior posts rather than an absolute requirement. While PhD graduates in electrical engineering – in relation to the telecommunications sector – had accessed an abundant and prosperous labour market in the early 2000s, employment opportunities have slowly decreased in the past few years.

In addition, employment considerations of electrical engineers have been affected by the size of the Greek market, the limited activity of R&D undertaken by companies operating in Greece and the culture of employers towards PhD graduates, as was underpinned by the illustrative quotes. Such factors have restricted the career choices of doctoral holders in electrical engineering especially when they envisaged working where they could utilise their specialised knowledge and skills:

> *"The market in Greece is quite limited. For example, the big companies that provide internet services are ten. And there are another 15 companies that do integration of telecommunications and informatics' projects and require this type of competencies and skills and that's it [...] of course, there are PhD graduates who work in a company that has nothing to do with their PhD."*

[gr9, male, electrical and computer engineering, network coordinator, state enterprise, Greece]

> *"There is no pure R&D in Greek private companies that design complete circuits? Apart from a couple of companies. So the PhD qualification cannot be*

fully utilised […] there is a small market and not so much focused on R&D but in design which somebody could do with only a Master's degree."

[gr14, male, electrical engineering (microelectronics), Professor of applications, Greece]

Nevertheless, there were positive examples of companies that deployed to some extent the knowledge and skills of the PhD graduates, but this seemed to be dependent on the culture of employers towards the PhD:

"On the one hand, there is a private sector that does not offer any way out, where the PhD is not useful. On the other hand, there is a private sector which trusts you, potentially due to the PhD, where the prospects are definitely better […] I have also seen PhD graduates who are working in companies and you understand that they vegetate, and PhD graduates that work in companies and they have in essence utilised the knowledge they have acquired."

[Gr9, male, electrical and computer engineering, network coordinator, state enterprise, Greece]

Interviewees also noted that commercial spin-offs in the Greek labour market are difficult. As (Gr10) mentioned '*Greece is not mature yet for such things'* while working in academia entails more likelihood to develop such a company. The small private sector share in R&D activity, the low number of patents and incubators reinforce the image of Greece as a country with few opportunities for innovation (Komninos and Tsamis, 2008). The inefficiency of spin-offs and science parks in Greece has been limited by factors, such as lack of funding and management expertise, and bureaucratic procedures in starting up an enterprise (Sofouli and Vonortas, 2007)[189]. Systemic factors, such as the economic and cultural Greek context (limited links with universities and concentration of high-

[189]In the 1990s, incentives were provided for development of business incubators and science parks in Greece. However, they were found to be inefficiently managed by public sector employees who did not run them as profit-making initiatives. After 2000, it became clear highlighting the importance of attracting public sector funding and expertise to reap the benefits of such investment.

technology intensive companies, entrepreneurship and management culture) were also emphasised as necessary conditions for the success of such initiatives.

8.2.4 Disciplinary labour market: Biologists

In comparison to the engineering profession in Greece, there is limited information on the labour market for biologists. There is a high proportion of PhD graduates in biological sciences in both Greek and UK universities (which is also depicted in this study). At graduate level, Karamessini (2008) reported that biology graduates presented one of the highest shares in postgraduate study[190]. This might be explained by the broad orientation of first degrees in biology in Greek universities, and the importance attributed to postgraduate studies for further specialisation and potential enhanced career prospects in the Greek labour market. In contrast, UK institutions offer more specialised first degrees leading into disciplinary specialisms early on and potentially encouraging to pursue postgraduate studies.[191]Two interviewees in this study selected a UK university for their first degree because they wanted a specialised degree, such as Genetics and Biochemistry, not available in Greece. Both had continued their studies in the UK, in biological sciences' specialisms and had remained in the UK to work.

An established Greek academic in biological sciences, provided similar reasons for the big student export in the UK for this field: the broader inclusion of biological

[190] Karamessini (2008) found in her study that biology graduates present the fourth highest percentage (61%) in pursuing postgraduate studies among 31 scientific fields in Greece.
[191] In a recent Vitae Report (2012), 'What do researchers want to do' , it was reported that most PhD graduates developed their interest in research and a subject area during their first degree studies leading them todoctoral studies.

sciences subjects (irrespective of school that PhD candidates belonged to), the long tradition and popularity of the UK as a Masters' degree destination country, the duration and the specialist character of postgraduate studies, and the availability of PhD studentships. He specifically mentioned regarding the different 'meanings' of biology in Greek and UK universities and how PhD degrees in biological sciences were recorded in both countries. He also highlighted the lack of a long Greek tradition in biological sciences. The difference in terms of duration of postgraduate studies between the two countries was also suggested as a reason for selecting a UK institution:

> *"We should not forget that the Master's in the UK lasts for a year, but two years in Greece. And sometimes, if students go to the UK for a Master's, they will stay there. In Greece, many people would do a master's for two years, sometimes they delay and they complete it in 3 years […] In the UK, they could think, I have done a year here, I was offered a PhD and in three years I can complete my PhD. Therefore, this means the completion of both a Master's and a PhD in the UK within four years, while for the same degrees it could take seven to eight years in Greece."*

In terms of professional prospects, interviewees notes that biological sciences graduates could work in different sectors in Greece. Although the PhD might not be necessary in most posts, it often becomes an advantage to its holder. A graduate with a biology degree can work in a lab within a university, a research institute, a diagnostic centre, a hospital and in industry, especially in the food, pharmaceuticals, and cosmetics sectors. In addition, there are employment opportunities in the education sector, working as a teacher or professor in secondary or tertiary education respectively (a PhD is required in the latter and is an important asset in the former). Furthermore, biologists could be employed

within ministries, organisations and private companies related to biology as a scientific consultant. In the public sector, the doctorate provides extra points in public competition posts such as becoming a teacher in primary or secondary education or working in public forensic labs.

While the biologists have a wide range of employment options, the number of vacancies is limited, so good graduates are often advised to undertake postgraduate studies, to become more competitive in the Greek labour market. Nevertheless, the private sector in Greece does not always fulfil the career aspirations of PhD holders in biological sciences especially if they are interested in challenging PhD related employment such as in R&D pharmaceuticals and biotechnology companies. This sector is lagging behind compared to EU countries reflected in the low R&D investment (OECD, 2009[192]), and the limited business activity of biotechnology in Greece (Sakellaris and Chatjouli, 2001; Boudourides and Kalamaras, 2002). Sakellaris and Chatjouli (2001) have reported that limited research and funding, the small size of the Greek market, the high costs of infrastructure and specialised personnel and also the low opportunity for biotechnology applications and limited innovation character in the field accounts for the situation in Greece.

[192] According to the OECD report (2009) on Biotechnology Statistics, Greece had one of the lowest investment from venture capital in the life sciences in 2007 (0.42 million PPP/$) with Hungary and Portugal reaching 3.8 and 3.3 million respectively. In addition, in comparison to the other OECD countries, Greece also showed low production of biotechnology patent applications with four in 1994-96 and 11 in 2004-2006. While the report refers to additional biotechnology indicators such as firms devoted to this field etc.

Similarly, Kontozamanis et al. (2003), in an overview of the Greek pharmaceuticals market, found an increasing trend of imported medicines accompanied with a decreasing number of medicines domestically produced during 1987-2000[193]. Interviewees in this study repeatedly echoed these issues emphasising that pharmaceutical companies in Greece do only sales and clinical testing:

> *"Theoretically, we can work in pharmaceutical companies of course. In Greece there is no research sector, according to my acquaintances who work on the promotion of medicines. A good case [of employment] is when they work on clinical tests. No, they don't do the clinical tests, they are responsible for the supervision of clinical tests, the organisation and things like this."*

[Gr4, female, electrical and computer engineering (biomedicine),university researcher, Greece]

> *"When I was looking for a job, all the ads were for medical visitors, they would never hire me to do project management. They don't do research in Greece. It is very different abroad; […] In Greece there is nothing, only sales. [...] I also had an offer to sell medical machines and promote them in hospitals and scientific institutions but ok I did not want to do this."*

[Uk4, female, biological and physical sciences, management consultant, Greece

Other options could also be as a UK-educated interviewee with an exposure in labour market outside Greece mentioned:

> *Uk9: "beyond the health industry, there are also patent offices or offices of human rights protection in the context of research, bioethics, but I don't know how developed these offices are in Greece. Bioethics has started being developed but I don't think that they are yet legal offices which specialise in patents and issues related to research where biologists could be absorbed. In the UK, I know that they utilise biologists in these occupations."*

[193] They also argue that the lack of a long-term industrial policy in Greece has led to this situation where many pharmaceutical companies are observed decreasing their investment in capital equipment shifting towards cheaper imported medicines rather than local production.

Similar to the telecommunications sector for electrical engineers, the pharmaceuticals/biotechnology industry is restricted by Greek contextual considerations, such as the small market, the low R&D activity and the lack of long-term industrial policies. Consequently, employers in these sectors had a limited need for specialised personnel and PhD graduates perceived these careers as unattractive due to the non-challenging tasks (i.e. sales, promotion) and the potential atrophy of their skills and knowledge that such employment included.

Following these sections where the engineering labour market is male-dominated and the high incidence of female doctorate holders from Greek and UK universities compared to other disciplines of natural sciences, the significance that gender plays in the labour market considerations for this highly skilled workforce is discussed more broadly.

8.2.5 Gender

Apart from subject discipline, gender was also a critical parameter influencing career options in the public and academic sector. While according to the survey responses no great differences were observed between male and female participants, women were more likely to work in public services while more men were working in the private sector. The Greek national study (GSRT, 2008) reported a similar finding.

Table 8.2 Current employment situation by gender

Current employment	Male	%	Female	%	Total
Employed full time	142	75.9	46	80.7	**188**
Self-employed/freelance	31	5.9	4	5.3	**35**
Employed part time	11	16.6	3	7.0	**14**
Unemployed & looking for work	3	1.6	1	1.8	**4**
Doing sth else (travel, maternity, etc)	0	0.0	2	3.5	**2**
Other	0	0.0	1	0.8	**1**
Total	**187**	**100**	**57**	**100**	**244**

This is likely to reflect the different working conditions in the public and private sector in Greece (Koskina, 2008). In a recent study of Greek university graduates (Karamessini, 2008) it was found that women preferred working in the public sector. Partly mirroring the structure of the Greek economy where employment in the public sectors reaches 21-22% of total employment (IMD, online database).

Purcell et al. (2006) in a study of UK graduates reported the importance of inequality in different benefits in public or private sector graduate employment. Women working in the public sector appreciated the *'long term security, the socially helpful work'* while their male colleagues valued the opportunity for high earnings and the availability of *'opportunities to reach managerial level'* (ibid, 2006, p.65).

In the academic sector – which in essence belongs to the public sector in Greece – previous research has been devoted to the impact of gender inequalities in the careers of female academics and scientists (Sabatier et al., 2006; Fox, 2001; Etzkowitz, et al., 2000; Asmar, 1999; Rossiter, 1982). While female scientists have increased, they continue to be in less advantageous positions compared to their male counterparts especially in terms of academic ranking, income, etc. (Fox, 2001; Ward, 2001; McNabb and Wass, 1997;).

In Greece, studies on women in science and academia present similar findings (Maratou-Alipranti and Tsirigoti, 2009; Karamessini, 2006; Eliou, 1988). The phenomena of horizontal and vertical segregation as well as educational segregation have been investigated (see Ntermanakis, 2005; Vosniadou and Vaiou, 2005; Maragoudaki, 2007; Petroulaki et al., 2008; Karamessini, 2008). Horizontal occupational segregation is demonstrated by the increase in the index of segregation indicator (ISE) from 29.5% in 1993 to 33.6% with a limited number of women in occupations related to technology and physical sciences (Ntermanakis, 2005). Despite the increasing proportion of women in higher education in Greece, they are still under-represented in the natural sciences and engineering reflecting the reproduction of gender stereotypes in educational choices (Petroulaki et al., 2008). Furthermore, gender inequality is observed in Greek academia with a higher proportion of women in the lowest ranks of the academic hierarchy (Vosniadou and Vaiou, 2005; Maragoudaki, 2007). This

phenomenon persists according to the latest EU figures (EC, 2009; SHE figures)[194].

Gender considerations were also reported in the interviews with women PhD graduates in this study. One of the interviewees was also involved in a European project where they looked at gender stereotypes in Europe. She also drew from her own experience in relation to her PhD decision and the response from her family, to explain that such stereotypes still exist in Greece:

> *"[My family] responded positively, I didn't have any problem or objections. Nevertheless they had the following issue whether the decision to study for another 5 years – since I would start for a PhD –, would prevent me from family-building or if it was something that I could do in parallel [] this was their concern. Because they were thinking that "she took her 4-4.5 years to complete her first degree and now she is telling us about another 5 years perhaps she would stay single […] I don't think that they would say the same thing to a man as they didn't say to my brother let's say. He did a PhD but it didn't come up to discussion 'what will happen, will you have a family?' [...] In terms of her working in an engineering school] if you look at the distribution at professorial level, you hardly see any women and this is not coincidental in my opinion."*

Later, when asked about her future career prospects she also emphasised how family considerations limited her mobility

> *"For the near future, I have the problem that I have two children so it is very difficult to consider moving away from Athens or Greece. On the other hand, nevertheless, I am happy, so there is no reason for me to leave, so I think I will stay and I would carry on working."*

[Gr4, female, electrical and computer engineering, university researcher, Greece]

[194] The proportion of female academic staff by grade for 2007 was the following: Grade A: 11%, Grade B: 23%, Grade C: 32% and Grade D:39% while female academics represent 29% of total academic staff in Greece versus 38% of the EU-27 average.

Similarly another female working in academia as a researcher explained how her family reasons could restrict her future career progression:

> *"There are various factors that affect my career. I am married with two children and this is already limiting me. I am not willing to get elected in Thessaloniki because my family situation is such. My husband is also working here and he has a good job […] my family environment continues supporting me so I would not be able to leave. At this point, this is a very important factor, right? In Athens, the posts are definitely limited, have immense competition, there are rarely vacancies and there are many PhD graduates with high specialization and qualifications."*

[Gr5, female, electrical and computer engineering, university researcher, Greece]

Studies on scientific careers of women in Greece have highlighted that family and childcare responsibilities are amongst the main barriers of career development (Maratou- Alipranti and Tsirigoti, 2009; Periktioni, 2007[195]). Social stereotypes for gender and family responsibilities are still relevant in the Greek society. Maratou-Alipranti and Tsirigoti (2009) reported that the Greek patriarchal society and social inequality of gender is reproduced through the school system and its 'hidden curriculum'[196]. According to a research project mapping female potential in the sciences in Greece, state policies and childcare responsibilities hindering career development while indirect discrimination is experienced by female researchers

[195] Periktioni is a network of Greek female researchers from different employment sectors (HEIs, research institutes, companies) to promote gender equality. This network has been funded by the EU and has undertaken a number of projects exploring the gender equality of female researchers and scientists in Greece. As a result of this network's activities, a legal provision has been approved by the Greek parliament to ensure a representation of women in research committees.

[196] As the authors argue, the social construction of identity has been one of the topics that preoccupied gender studies in Greece (Kordaki and Tsagala, 2007; Stavridou and Sachinidou, 2007 ; Zigou – Karastergiou, 2006). In their review of these studies, they refer to findings on the gendered perceptions of teachers which influence their students' ambitions while school textbooks reflect the gender inequality through male images in prestigious roles and female roles related to maternity and family.

who have limited time due to family commitments (Periktioni, 2007). In addition, two thirds of female researchers (66%) indicated in this project that gender was an obstacle in their career progression.

Most female interviewees in this study appreciated the flexibility and the work conditions in the academic sector, because it accommodated family considerations. However, this was not shared by all the interviewees. An interviewee employed in UK academia was interested in non-academic employment as she perceived this sector fitting more her personal interests but also as being family-friendly. Asked about the pros and cons of academic and non-academic employment she explained:

> *"Academia for example gives more holidays [...] but it also requires more time because you are under much pressure, meaning that you are working during weekends and ok, most of the professors I am cooperating, for example one got over exhaustion because this lady had worked so hard that she became a professor at 33 years old which doesn't happen in sciences every day […] she was overworked, she took the professorship and then she was in bed for two months. I don't want to become like this."*
>
> **[Uk1, female, chemical sciences, postdoc, UK**

She then went on to talk about the pitfalls of academic freedom. While flexibility was welcomed in the working hours, academic jobs often required working during weekends and entailed continuous pressure for publications and getting research grants. She thus had more positive perceptions of working in the private sector due to the fixed timetable (9-5) which would facilitate her in having a family and acquire a healthy life- balance.

Gender stereotypes have also been evident in the private sector in traditional male-dominated sectors where higher education qualifications were not required in the past. An interesting example was provided by a female PhD graduate, educated in UK in plant biology who had looked for job opportunities in the Greek private sector when she returned to Greece after her PhD. She reported that wherever she was called for job interviews in her sector, there were two issues: over-qualified and gender. Close to her PhD, she was interested in becoming a technical consultant in supermarkets and companies that produced, processed and imported fruits and vegetable. However, the sector was traditionally male-dominated and required work-experience rather than qualifications. She described the attitudes she was confronted by in Greece and how the possession of PhD was becoming an obstacle in her career:

> *"I was told that the agricultural science profession and relevant professions were not for a woman. Well they did not say this. They had said to me: 'Well, you are also a woman'. That was generally the attitude. And in Greece, they were looking at the PhD as a problem, not as an achievement or an advantage. I think there was possibly a fear that I would stay there for a year and then I would leave because I had a PhD and I would find something better, I don't know how they saw it [.] I had begun to consider removing it from my CV but I did not know how to explain the 4 years between the first degree until the period I started applying. Finally, I returned in the UK and started applying for jobs."*

In the UK, she got a job as a food consultant. Her PhD was a not a prerequisite but it counted as previous experience. In the UK, the sector had similar characteristics having mainly male colleagues with long-service usually much older than her. However, it was possible to find a job because of the increasing impact of technology and science in the food production sector, which has changed from a labour intensive traditional industry to a highly innovation sector:

"Often up to now, people who worked as technical managers/consultants had started in low posts and they have progressed slowly using their experience, instead their knowledge through a degree. Of course, this changes and nowadays you also see people with PhDs in these posts."

[Uk7, female, biological sciences, food consultant, UK]

Gender is an important variable for examining career development of PhD graduates as evidenced. The examples above demonstrated not only the barriers to career progression in scientific careers, but sometimes accessing male-dominated occupations in the private sector. Despite the increasing share of women in higher education and employment, gender stereotypes and inequality are still evident in academic and scientific careers in Greece and beyond.

8.3 Conclusions

The Greek academic system was widely criticised by PhD graduates and academics in this study in relation to the selection and appointment of faculty academics. The Greek academic labour market – far from meritocratic – operates more as a civil service system rather than an academic marketplace. The nepotistic culture facilitated perpetuation of the *status quo* rather than advancing institutional interests in recruitment and selection of academic staff. The difficulty of acquiring an academic post in the Greek system was stressed requiring many sacrifices from early career PhD researchers. These researchers worked in various short-term teaching and research posts for a long time, which had resulted in stints of self-employment, publishing under limited resources and tolerating job insecurity. Timing, chance and a highly influential supervisor with strong academic networks were key to accessing the academic hierarchy.

Furthermore, the Greek academic system was an even more forbidding workplace for the UK-educated – especially in their early career – penalising them to some extent for their doctoral studies abroad, pushing them towards careers in the private or public sector. However, the effect of country of doctoral education appeared to change in the mid-career when it was combined with the establishment of an academic career abroad. According to participants, a long and high achieving academic experience abroad facilitated the integration of returnees into Greek academia.

Reflecting on the career stories of the interviewees in this study, it becomes obvious that individual ability, motivation, persistence and academic/research achievement might not be enough for PhD graduates to shape their own career paths but having to *'re-adjust, compromise and reconsider'* their choices under an increasing number of variables (structural and contextual) that are beyond individual control, especially in the current Greek labour market.

The scientific field was a strong determinant for employment choices and opportunities especially in the Greek labour market that is characterised by occupational segmentation and inflexibility. According to the perceptions of the survey respondents, the discipline of the first degree played a crucial role in the availability of employment opportunities, especially when the doctorate was in a different disciplinary area. Engineering has traditionally been a prestigious profession providing access to a wide range of job opportunities both in the public and private sector, due to the enhanced leveraging power of its professional

association. Apart from high employability linked to their degrees, engineering schools also safeguarded substantial EU project funding to attract PhD candidates from scientific fields, such as physics. This disciplinary mobility was also indicative of an instrumental approach where the doctorate in engineering aspired to broadening labour market opportunities in Greece. Various employment options were available to biological sciences' graduates such as pharmaceuticals, diagnostic centres and hospitals. Nonetheless, graduates in biology were not as employable as first degree graduates in engineering, since further studies were important for enhanced career prospects.

The wide range of employment opportunities in both engineering and biological sciences might be indicative of the reasons behind the increased proportion of Greek PhD graduates in these areas as evidenced by statistical information (in Greece and the UK) and this study's high participation. The PhD provided a competitive advantage and further specialisation rather than absolute requirement in the respective labour market considerations in Greece.

This chapter has shown that labour market considerations were crucial in shaping career choices of highly skilled, illustrated by the emergence of the telecommunications' sector in Greece during the period where study participants completed their doctorate. However, the high demand for engineers was soon saturated creating difficulties in absorbing the increasing supply of highly skilled, which was triggered by the prosperity of this new market.

Gender inequality in scientific careers also applied in the Greek context. The PhD was sometimes perceived as an interruption or a potential obstacle to build a career by family and societal environment. Social stereotypes in relation to women's roles are still reproduced by the traditionally patriarchal Greek society. Gender was, thus, highlighted as an important factor limiting to some extent academic career choices and mobility for enhanced career development due to family and childcare responsibilities. While no income inequality is observed – since the salaries are regulated by law with no discrimination – there is a higher share of female academics in the lower ranks of the hierarchy with their male counterparts dominating the upper echelons of academic power.

A similar situation was demonstrated in the private sector especially in traditionally male dominated occupations. With the advancement of technology and the graduate expansion there are increasing requirements for specialised knowledge where the PhD can substitute to some extent long experience as showed in occupations related to food technology.

PhD graduates reported difficulties in pursuing careers in the Greek private business sector where they could utilise their doctoral skills and knowledge, contributing to both their personal fulfilment and job satisfaction and their respective employer with their expertise and advanced set of skills. Furthermore, the internal character of the academic labour market (with subjective selection criteria), rare academic vacancies, the predominance of precarious employment along with the absence of a national research fund to support post-PhD

development, appeared to obstruct the career development of this highly skilled workforce. This situation along with the fatalistic image of Greek academia reflected in the accounts of the participants has led some to readjust their career aspirations working in occupations that might not be as intrinsically satisfying as the one they initially envisaged. This is indicative of potential loss in individual and collective returns from investment in doctoral study in both academic and non-academic sectors.

Chapter 9 EMPLOYERS' VIEWS ON PHD GRADUATES

9.1 Introduction

After examining the career paths and the factors that have influenced career development of PhD graduates, we now turn to the 'demand' side. Increasing emphasis has been concentrated on the multiple career paths that PhD holders can follow (EC, 2003), challenging the traditional perception of PhD as a passport for academic careers. PhD graduates are seen as part of a highly skilled workforce that contributes to innovation, technology advancement and economic growth from academic routes and non-traditional occupational routes, such as knowledge-intensive roles in the private sector.

Few PhD graduates are employed in the non-academic sector and only a small proportion of those surveyed and interviewed for this study did so. Nevertheless, this chapter focuses on the Greek non-academic private sector since there is no readily available information on how this highly skilled workforce is regarded in non-academic work environments. Considering that the number of public sector posts is shrinking, it can be argued that more PhD graduates may follow non-academic paths, in-line with government aspirations that such highly-qualified labour has the potential to contribute to the Greek knowledge-based economy.

Therefore, this chapter aims at increasing our understanding of how non-academic employers in Greece perceive this non-traditional workforce, to what

extent it is informed about them and how it deals with them. Although not a representative sample, the employer representatives cited in this section provide data representing a diverse range of Greek employers' views regarding the doctoral workforce, their own approaches, together with the benefits and drawbacks of recruiting PhD graduates.

Since no previous research has been undertaken in Greece, this study was informed by previous studies on employers of PhDs (see for example CIHE, 2010; Souter, 2007; McCarthy and Simm, 2006; Purcell and Elias, 2006). In addition, interviews with UK employers enabled the comparison of UK and Greek employers' data enriching the analysis and the presentation of the findings.

But before looking at the analysis of the data, the following section outlines contextual information for the Greek business environment in terms of the corporate and national culture, the human resources management and industrial relations in order to understand the broader conditions in which PhD recruitment in Greece takes place.

9.2 Contextual information for Greece: corporate culture and human resources, industrial relations

As already discussed in chapter three, Greek industry is characterised by small and medium-sized enterprises (SMEs) comprising an overwhelming majority of

companies[197] affecting industrial relations, management culture and human resource management (HRM) practices. Small size companies coupled with family ownership, have had long-term implications for Greek management culture and subsequently HRM. It was not until the establishment and operation of foreign-owned subsidiaries of multinationals in Greece that these implications were made evident.

In terms of management culture, Makridakis et al.[198](1997) had identified a dualism of firms in Greece on the basis of size and ownership of and classified them in terms of: the family-owned firms; and subsidiaries of multinationals. Family owned firms were often managed by the owner of the company and they were susceptible to short-term strategies due to the continuous legislative changes and unexpected events in the Greek economy. In this context, the role of the state had been criticised for its strong intervention towards supporting unproductive and inefficient Greek companies with the view to artificially stabilise employment (Bourantas and Papadakis, 1996). This has prevented Greek owned

[197] According to the Small Business Act (SBA) fact sheet for Greece in 2010/11, 96,5% of total enterprises were micro enterprises with less than 20 employees. These fact sheets are an initiative from European commission to support small and medium size enterprises and through annual fact sheets to provide an overview of the trends and national policies affecting such enterprises.

[198] This study refers to the overlapping function of manager –owner in Greek family owned firms which has serious implications for the future of the firm since decisions are taken on the basis of personal interests rather than long term strategy and profit maximization. Managers have limited experience of running a company – usually only their own- and have the tendency to concentrate all the power in them want to participate in all decisions from the most important to the most trivial. In addition, it is also demonstrated in this study that Greek firms were expanding instead of modernising their establishments, equipment and practices which has been criticised by academic studies since this decision harmed productivity in the long term in comparison to the foreign firms. For more information on Greek management culture with a comparison between Greek owned and foreign owned firms , see Makridakis et al.1997; Bourantas and Papadakis, 1996; Bourantas et al,1990.

companies from adopting modernisation strategies compared to firms overseas (Makridakis et al., 1997).

Papadakis (1993) also found that Greek-owned were less likely to follow rational processes and formal rules and procedures for decision-making in comparison to foreign subsidiaries. Power and control were concentrated at the top management level where it was not rare to find the owner with his/her relatives (Makridakis, 1996; Nikolaidis, 1992). In contrast, subsidiaries of multi-national companies (MNCs) had long-term strategic alliances with large foreign companies with CEOs being professional career managers, well-educated and experienced in sophisticated management systems abroad. Their decision- making process was characterised by rational processes with careful examination of options and abiding to formal rules and procedures (ibid). The characteristics of Greek management resulted in limited use of sophisticated management system including HRM practices such as recruitment and selection in Greek-owned compared to foreign subsidiaries (Papalexandris, 1988; Myloni et al., 2004).

In the 1980-90s, Papalexandris (1992, p.1) concluded that *'there is no real distinction between them [*personnel management and HRM*] in Greece'.* She had previously reported on the limited planning of managerial positions, the lack of specialised staff for personnel practices[199] and the absence of sophisticated

[199] Papalexandris mentions that this staff in large companies was comprised of employees with legal background or experienced army or civil service officials. Thus, they were not trained to organise and implement practices that would require specialised skills such as personnel planning or interviewing skills etc. Greek firms starting as family owned were expanded in a 'haphazard

strategies in the Greek firms (Papalexandris, 1988)[200]. More than a decade later, little change had taken place since Greek firms were found less likely to have a HRM strategy – linked to corporate strategy –and to undertake long-term HR planning compared to subsidiaries (Myloni et al., 2004). Based on European data on HRM outsourcing, it was reported that multinational and large Greek companies adopted a more sophisticated, strategic and thus high cost HR approach than Greek SMEs employing low cost, standardised and non-tailored HR practices (Galanaki and Papalexandris, 2005).

While recruitment practices in Greek firms were mainly based on acquaintances and social networks[201], universities were not included in the recruitment process.[202] However, Myloni et al. (2004) demonstrated how interaction between subsidiaries of multinationals and Greek firms affected both parties; the former embraced more the use of references and recommendations in employee selection, while Greek firms provided evidence of more modern HRM practices

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way' which prevented them from careful planning of their managerial staff and recruitment practices since they did not have the know-how to develop these vital practices. The HRM function was often undertaken by the CEO/owner or the financial manager of the company without previous experience or education in such role.

[200] Other points raised: 'owner-manager age, education and style play a major role in a firm's performance' p.70 and is mentioned that there is a belief that overlapping ownership and control has led firms to seek short term profits and decide according to personal and family reasons rather than company interests.

[201] A comparative European study (Eb and Smes, 2007) exploring recruitment strategies showed that private contacts was the primary source (50%) in Greece, followed by newspapers and private labour market institution, for finding vital personnel, but the significance of informal methods decreases as the size of the company increases.

[202] However, university graduates were filling the managerial posts and universities are much used in other countries.

such as performance related pay and systematic training. Furthermore, high job mobility and high turnover in managerial posts have also contributed to exchange of practices and knowledge – either HRM knowledge or regulatory and Greek culture knowledge – between the local and the subsidiaries.

Greek companies appeared to employ more traditional recruitment and selection methods, such as CVs and interviews rather than psychometric tests and assessment centres compared to subsidiaries (Papalexandris and Stavrou-Costea, 2004; Myloni et al., 2004).Greek firms valued more formal qualifications and work experience while subsidiaries were more oriented towards personality traits such as integrity, cooperation.

In terms of industrial relations context and collective bargaining, there are different types of national collective agreements regulating salary and working conditions of employment in Greece. In these collective agreements at sectoral and enterprise level, the acquisition of a master's or a doctorate qualifies the employee to obtain a higher salary through a '*studies'* benefit'. This financial benefit is calculated as a factor percentage of the main salary which is different between a master degree and a PhD holder. Sectoral level agreements for engineers, biologists and physicists, mathematicians and chemists show that the doctorate is 'translated' either with different ratios or as work experience in the cases of chemists (Table 9.1).

Table 9.1 The wage premium of the PhD according to law

Discipline	Collective agreement number	Working in
Mathematicians	No agreement	
Physicists	No agreement	
Biologists	P.K.124/15.9.2000	Industry :15%
Biologists	P.K. 40/13.7.2009	Private clinics: 26% as medical personnel
Biologists	P.K.130/9.10.2009	Private centres of diagnosis: 15%
Chemists	P.K.91/28.7.2008	Industry: 4 years of working experience
Engineers	DA 31 /2005	Industry as technical scientists: 14%
Engineers		technical companies: 15%
Engineers	P.K./06.03.2009	Technical, construction and assessment companies in the Attica region:13%

While there are not substantial differences between the various agreements, it is demonstrated how the PhD can affect the financial compensation of an employee and potentially the decision for a candidate selection.

9.3 Profile of UK and Greek employers that participated in this study

As discussed in chapter two, UK studies (CIHE, 2010; Connor and Brown, 2009; Jackson, 2007; Purcell and Elias, 2006; McCarthy and Simm, 2006; Souter, 2005) have identified the need to obtain more detailed information on the views of employers, which will feed into policy and practice. Previous research has divided employers of PhD graduates on how and why (specialists/generalists) recruit this

highly skilled workforce[203], which is used in this study (Jackson, 2007; Purcell and Elias, 2006; Connor and Brown, 2009; CIHE, 2010).

The reason for recruiting PhD graduates is expected to affect the way that employers would look for them. Taking into account the above classifications it is expected that specialists' employers would use more individualised PhD specific approaches such as: sponsoring, contacts with professors and research groups. In contrast, generalists would be more likely to use more collective approaches such as targeting bigger pools of PhD graduates such as prestigious universities, attend or organise PhD events. This study will examine whether this is true for the employers in this study.

This section outlines the non-academic employers who participated in this study. Interviews with both Greek and UK employers were undertaken to explore: to what extent they were aware of the skills and knowledge that a PhD graduate might have acquired; how they perceived the PhD in terms of its role, the benefits or the concerns that might entail for the non-academic sector; plus to what extent they were targeting, specifically, PhD graduates from the natural sciences and engineering subjects and the rationale behind this targeting. Information about the selection of employers is provided in the methodology chapter while the profile of employers is outlined next.

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[203] As mentioned, generalists' employers seek PhD graduates for their transferrable skills while specialists are interested in the subject specific knowledge and skills that doctorate holders carry with them.

Twelve interviews were undertaken with UK employers and nine in-depth interviews with Greek employers. The UK interviews were primarily undertaken to inform the interview approach to be taken with Greek employers and understand the main issues regarding recruitment of PhD graduates. The targeted employers were considered appropriate because they were interested in the PhD labour market, had experiences with recruiting PhDs and might be expected to be favourably biased towards PhD recruitment. During analysis of the interview data, interesting differences were identified, which informed and enriched analysis of the data from the employers in Greece.

The UK employers that participated in this study were mainly MNCs, mostly UK-owned, representing organisations that operated in both the services and manufacturing sectors[204] (Table 9.2). According to sector distribution, they were from a range of sectors, including: the financial services; consulting and business services; manufacturing of electronic machinery and equipment, medical equipment, and agrochemical products, etc. Many of the companies involved in the study were medium-sized (> 250) to large (> 500) with only one company having personnel up to 50 people[205].

[204] When the term UK employers are used, it refers to employers who operate in the UK irrespectively whether they are foreign owned or UK owned. Distinction in terms of ownership might be used in the text in order to form conclusions where ownership might play a role.
[205] The definition of the companies was undertaken on the basis of staff headcount.

Table 9.2: Characteristics of UK Employers involved in the study

ID	Employer classification regarding PhD recruitment	Ownership of company	Personnel	Sector distribution	Type of company
EUK1	Specialist	UK	1500+	Services	Multinational
EUK2	Generalist	Foreign owned	1500+	Manufacturing	Multinational
EUK3	Generalist	UK	250-499	Services	Multinational
EUK4	Generalist	UK	250-499	Services	Multinational
EUK5	Specialist	Foreign owned	1500+	Manufacturing	Multinational
EUK6	Specialist	UK	250-499	Manufacturing	Multinational
EUK7	Generalist	UK	1 to 49	Manufacturing	Multinational
EUK8	Specialist	UK	1500+	Manufacturing	Multinational
EUK9	Generalist	UK	250-499	Services	Public sector
EUK10	Generalist	UK	500-999	Services	Private company
EUK11	Specialist	UK	1500+	Manufacturing	Multinational
EUK12	Specialist	Foreign owned	500-999	Manufacturing	Multinational

Counter to the original research design, it proved possible to interview only a small number of Greek employers to be able to fit within the time constraints of the PhD programme whilst adhering to the planned scope of the research[207]. The

[206] The sector classification of the companies that participated in the study was based on the NACE classification which has taken the acronym from the French name *"Nomenclature générale des Activités économiques dans les Communautés Européennes"* (Statistical classification of economic activities in the European Communities). NACE is a pan-European classification system which groups organisations according to their business activities.

[207] This was essentially a result of unanticipated difficulties in obtaining access to Greek employers due to economic and social turbulence during the fieldwork period, as discussed in Chapter four.

findings, while not representative of 'Greek employers', nevertheless provide useful insights into perceptions of employers in Greece regarding PhD graduates, in the absence of more representative and comprehensive data, and have identified priority issues for research.

Human resources' representatives from eight Greek-based companies were interviewed including an R&D director (E5 and E7 were in the same company[208]). The majority of the companies in this study were multinational companies with two private companies (see Table 9.3) and were all based in Greece. Half of the companies were exclusively Greek, two were owned jointly with domestic partners and two were foreign owned. Most companies operated in the manufacturing sector with only two in the services sector. These included pharmaceuticals, manufacturing of machinery and equipment, business and consulting services, and telecommunications. The majority of the interviewees were female and were mainly responsible for HR functions.

[208] I was advised by the HR representative to interview additionally the R&D director who was able to provide more specific information about the PhD graduates recruited in the company.

Table 9.3: Characteristics of Greek employers-participants in this study

ID	Employer classification regarding PhD recruitment	Ownership of company	Personnel	Sector distribution	Type of company
E1	Specialist	Greek	500-999	Manufacturing	Multinational
E2	Generalist	Foreign owned	1-50[209]	Services	Multinational
E3	Specialist	44% Greek ownership,56% free float shareholding	1500+	Manufacturing	Multinational
E4	Specialist	Greek	1000-1499	Manufacturing	Private company
E5	Specialist	Greek	500-999	Manufacturing	Private company
E6	Specialist	51% Russian (foreign) 49% Greek	1500+	Services	Multinational
E7	Specialist	Greek	500-999	Manufacturing	Private company
E8	Specialist	Foreign owned	1-249	Manufacturing	Multinational
E9	Specialist	Greek	250-499	Manufacturing	Multinational

[209] It is a branch of a big foreign-owned multinational company.

Table 9.4 Job title and gender of interviewees in the Greek-based companies

ID	Post	Gender
E1	HR manager	Female
E2	Partner and managing director	Female
E3	Director of Human Resources	Male
E4	HR manager	Female
E5	Human Resource Manager	Female
E6	Recruitment and succession planning manager	Female
E7	Head of R&D	Female
E8	HR and Sales manager	Male
E9	HR Supervisor	Male

In this study, employers in the manufacturing sector were more concerned with recruiting specialists rather than generalists, which is unsurprising considering the differences in R&D between the manufacturing and services' sectors. Studies have highlighted the difficulty of identifying R&D activities in the services' sector since they often encompass more general functions and, lack formal structures (Miles, 2007; Djellal et al., 2003; OECD, 2002[210]). Hence, it is unsurprising that firms in the services' sector were more likely to be generalists targeting highly skilled employees to perform in different functions.

[210] R&D is not well defined in the services' sector and is unrecognised by the enterprises due to the non-specialised innovation that takes place (OECD, 2002). More information on this issue can be found in the revised edition of Frascati Manual (OECD, 2002, p.48-49)

Only two companies had a high number of PhD graduates among their personnel: a specialist Greek owned company (E5/E7) with almost 12% of total personnel (600-700 employees) and a generalist foreign-owned subsidiary (E2) with 25% of total personnel (30-35 employees).

9.4 UK and Greek employers compared

All employers operating in Greece – apart from a foreign owned branch of a multinational management consultancy (E2) – fell within the specialist employers' category and predominantly belonged to the manufacturing sector. In the UK sample, four out of twelve employers targeted PhD graduates for their specialised knowledge. Most companies had R&D departments which tended to value the highly specialised knowledge both in terms of discipline and subject specific knowledge and skills. Consequently, PhD graduates were considered mostly for R&D posts where a doctorate in a relevant subject area or field was necessary. Several employers from MNCs espoused the importance of specialised knowledge gained during doctoral studies, as advantageous to graduates seeking employment with them, as illustrated by the following:

> *"If we take the specialised part, which it is where we will recruit PhDs the recruitment of a PhD has some advantages. And the advantage that has in our case, is that it is very specialized. In order to find somebody, who has knowledge of x or y research that we are undertaking in this company these elements are being provided more easily from a PhD graduate rather a graduate from the Technical Universities, who has general knowledge. In this case, there is an advantage".*

[E3: multinational, mixed ownership, manufacturing, electronic machinery and equipment, 1500+]

Although subject specific knowledge was the primary reason for seeking PhD graduates, many employers emphasised the importance of combining a doctorate with a set of transferrable skills, which perceived as enriching the candidate:

> *E4: "In our R&D, all the people have a PhD because in this department we want very specialized knowledge and in depth knowledge of the subject..."*
>
> *Interviewer: "So you advertise positions which would require a PhD?"*
>
> *E4: "Of course, of course. I will advertise a position for the R&D that I need now and I want the person to definitely have a PhD .Why? Because I want the specialisation […] the company is buying the knowledge […] When I need a person to enrich my R&D, I need him to have specialized knowledge in food technology and possibly in specific products. Of course, I also want him to have a very good relationship and day to day cooperation with the marketing [department] I want him to have all the competences and skills. If he doesn't have them, we would have an issue."*
>
> **[E4: Private company, Greek owned, manufacturing, food products, 1000-1499]**

Personality was also acknowledged as central to PhD recruitment. However, for some employers, personality was confused with 'employability skills' such as communication skills, teamwork and leadership. This confusion is illustrated below by a representative from a manufacturing company who highlighted the significance of combining a PhD qualification with soft skills in employee recruitment:

> *"Apart from the fact that we are interested in somebody who has very good knowledge in his subject area, and that definitely is the first thing that we will look for, the second thing for us has to do with personality, because as I said: 'What am I going to do a person who although he /she has very high specialisation, cannot cooperate with the rest of the team, which he will need at some point. Or even, possibly to lead it or being in charge of [it]? If there has not been good cooperation, imagine what climate will be created among the existing engineers- employees!"*

[E1: multinational, Greek owned, manufacturing, electronic machinery and equipment, 500-999]

Evidence of possession of skills as well as credentials have become increasingly important in global recruitment, reflected not only through competence based approaches in HRM but also in the introduction of skills training in higher education curricula including doctoral programmes in countries such as the UK, as discussed later.

Generalists' employers in this study were found mainly in the UK sample of employers since only one foreign-owned company in Greece was seeking PhD graduates for their skills. Based on a threefold classification of skills by Purcell et al., (2008) [211], generalists' employers commented on the personal skills (discipline, commitment, maturity, independence) or academic skills (critical thinking, problem solving, creativity) of PhD graduates as the main reason for recruiting this workforce. As with those cited in CIHE research (2010), employers in this study found it easier to comment on this issue through comparisons of PhD holders with less qualified graduates[212].

[211] Purcell et al. (2008) undertook a graduate study of chemical graduates' employment and introduced the following threefold classification of skills:
•**traditional academic** skills, such as analytical thinking, critical thinking, problem solving etc.;
•**employability skills**, such as team working, communication skills, organization skills, etc; and
•**personal skills and attributes**, such as maturity, independence, discipline/stamina, etc.

[212] In this CIHE report on postgraduates (2010), UK employers did not find a lot of difference between MA and PhD graduates. As stated in the report: *'much seems to depend on individual attributes and talent, but also the quality and relevance of their postgraduate programmes or university attended'* (CIHE, 2010, p.12) it is clear that where they seek them, employers mainly recruit PhDs for their subject specific and technical skills. This might be expected to be the case where generalist skills are predominantly sought. As has been previously reported, employers were more concerned about PhDs than for Master's degree holders in all issues when recruiting

An example of a generalist UK employer highlighting the contribution of PhD graduates towards a more diversified workforce with different skills is illustrated:

> *Interviewer: "You are looking for PhDs, what is the main reason for that?"*
>
> *E10: "I guess we feel that we want to have a very broad spectrum of candidates applying for our graduate opportunities and PhD students have their own unique skill sets that they bring to the table, probably I think that s more around an additional level of maturity in terms of not specifically in terms of age, I guess it's more around, probably more commitment, more serious about their qualifications and what they want to achieve. It's a different skill set that PhD students bring to us as opposed to just a recent graduate."*

[E10: private company, services, 500-999 employees]

Interestingly, the representative of the only generalist company in Greece was the most 'articulate' in relation to the advantages of PhD recruitment which may be explained by her extensive experience and expertise in global HR functions. In this case, PhD graduates were considered to occupy general knowledge intensive positions, such as consultants' roles. As the representative specifically stated about the benefits of PhD recruitment:

> *E2: "Three benefits I would say. It is firstly people [the PhD graduates] that have showed that they have analytical mind, secondly they have discipline and stamina which are two big parts of what we are looking for and in addition they are not bull-shitters because they have studied something for many years in depth. Because when they talk [PhD graduates] they talk about essence, they talk because they have knowledge and many times this is a trap for us because*

PGs, with the more concern concentrating around PhDs lacking commercial awareness, limited work experience, unrealistic expectation and narrow focus/ overspecialised.

they don't dare to talk. What I was telling you before, they don't dare to talk if they [haven't understood everything[213]*."*

Interviewer: "Do you believe that this is a characteristic of the PhD in comparison with the other degrees?"

E2: "Much more intense."

Interviewer: "What would be the main reason for recruiting PhD graduates?"

E2: "Possibly the second, discipline and endurance."

Interviewer: "Could you give me an example?"

E2: "Somebody [who has completed a PhD] is consistent, he/she has showed in his life that he/she could work for 3-4 years on a topic-well ok with a tutor/advisor- but mainly on his own. So, they have this drive and afterwards we are seeing this at work that many times that they are quite independent people, of course they are older so they have matured more. And they are hardworking, they have endurance and we, in our work, sometimes we have peaks and we are working a lot and in high paces. Such people almost never have a problem; they have learnt working hard and persistently."

[E2: multinational, foreign owned services, business and research activities, 1-50 people (branch)]

For the generalists, PhD graduates were an important 'asset' for their company. This highly skilled workforce contributed to the diversity of the company employees and added credibility (or 'gravitas') as found in similar employer studies (Souter, 2005; McCarthy and Simm, 2006).

[213] The interviewer was making clear that PhD graduates in comparison with other graduates, wanted to have the overall picture, to know the fundamentals of what they are asked to do before they felt confident to express an opinion about this.

9.4.1 Additional benefits of recruiting a PhD graduate

Some of these skills and attributes commented by generalists, were also highlighted by many specialists' employers operating both in Greece and UK as additional benefits of PhD recruitment.

Although it was expected that participant companies operating in Greece – who targeted PhD graduates for their specialised knowledge and skills – would comment favourably on the traditional academic skills of this workforce, this was not the case. A potential explanation may be that these skills were taken for granted as part of the specialised knowledge and skills they valued in doctorate holders. Most of these employers emphasised benefits in PhD recruitment mainly with respect to personal skills and attributes. They frequently reported on a higher level of maturity and career focus compared to other graduates.

UK employers reported on similar personal characteristics but they were more likely to touch upon traditional academic skills (critical thinking, depth of understanding, problem-solving).

Interestingly, there were only marginal comments from employers in this study on 'employability' skills that PhD graduates brought to the workplace. This could suggest that many employers are unaware of generic competences gained through doctoral study. After all, skills such as team-working is likely to be inherent characteristic of doctoral programmes in sciences and engineering where there is greater likelihood for a PhD researcher to work as part of a team.

Furthermore, the majority of PhD graduates could argue that they have acquired or enhanced their organisational and project management skills during their studies.

As a matter of fact, PhD graduates in their reflective interviews confirmed that such skills were developed during the PhD. Interestingly, there was a consistent pattern in the type of skills reported by the UK-educated in comparison to the Greek-educated PhD holders. All UK-educated participants stressed the value of employability skills such as presentation and communication skills, team-working, multitasking, project management and academic skills (analytical and critical thinking), and less so personal attributes such as persistence, patience, independence, precision and being systematic. In contrast, Greek-educated mainly mentioned traditional academic skills such as their specialised knowledge and related methods, use of equipment and software relevant to their thesis, ability to process and analyse data and knowing how to search for information[214]. There were also cases in the Greek-educated group puzzled by the question of skills during the interview and it was often necessary to provide examples or probe further. In addition, while this group did not comment on the development of personal attributes in relation to skills, they often '*interpreted'* benefits and impact of PhD in terms of personal development and skills, for example: *'it was an act of*

[214] They also referred to employability skills such as project management, organisational skills and collaboration but these were developed in the context of research assistance for EU projects.

determination' (Gr1), *'it gave me the germ of organisation'* (Gr1), *'developed my character, becoming more methodical'* (Gr14) and maturity (Gr9, Gr15).

Through a comparison of employers and PhD graduates by country of doctoral study, it becomes evident that the views on this issue coincided, with the development of personal attributes and skills being acknowledged – almost unanimously –as a valuable outcome of doctoral education. Moreover, UK-educated and UK employers agreed on the academic skills gained during the PhD. The only difference consistently found between the two groups was that almost all UK-educated PhD graduates stressed the acquisition of employability skills in relation to the PhD – especially their presentation, communication and team-working skills – whereas UK employers (along with Greek-based employers and Greek-educated graduates) marginally reported this.

This is unsurprising considering the policy discourse and the emphasis on embedding employability skills in doctoral programmes in UK universities. The Roberts' report[215] (2002) has raised the issue of skills recommending dedicated training of transferrable skills to be integrated into doctoral programmes. These guidelines have been adopted by the RCUK and became part of standard PhD training throughout the UK HE sector. In addition, the Leitch review on skills (2006) emphasised the significance of rendering UK a *'world leader in skills'* in

215The Robert's report was written by Sir Gareth Roberts after being commissioned by the UK government and he reported in his well-known review 'SET for success' that there was a deficiency of scientific graduate workforce in specific subjects accompanied with a lack of transferable skills.

order to be a prosperous and competitive economy of the future. Within this effort, state, employers and individuals shared responsibility and engaged collaboratively in continuous development of skills. The review also touched upon postgraduate education[216] and underlined the role of *'higher level skills'* as

> *"key drivers of innovation, entrepreneurship, management, leadership and research and development." (Leitch, 2006, p.68).*

Following these well-known reports, numerous policy stakeholders[217] have undertaken various activities (such as studies and surveys[218], networking events) along with HEIs and employers to raise awareness on doctoral education outcomes and recruitment of postgraduates.

In addition, the increasing need of companies for high performers or the so called *'war for talent'* has been a preoccupation for the UK employers much more than for their Greek counterparts. This was echoed in a study of UK employers who acknowledged the increasing competition '*for PhD talent in the marketplace*' and considered important to meet this new challenge (Jakson, 2007, p.5).

In contrast, doctoral education in Greek universities is still based on the apprenticeship model, without any reference to skills' training. The limited awareness of the potential applicability of a doctoral degree beyond academic careers and its traditional perception as a highly theoretical degree – discussed

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[216] It refers specifically to MBAs and PhDs
[217] Such as such as the RCUK, Vitae, CIHE and career centres of HEIs.
[218] See for more studies by career centres: Jackson, 2007; McCarthy and Simm, 2006;Souter, 2005. From policy studies see: Vitae,2009 and CIHE,2010;Connor and Brown, 2009.

next– might also explain this finding. However, further research is required to explore whether this can be generalised beyond this study's participants.

Other benefits: training and work experience

Although recruitment of PhD graduates could be very costly, it entailed benefits mainly for specialists' employers in terms of less training and limited supervision required, as was illustrated by a Greek specialist employer:

> *Interviewer: "So there is not a need to train so much as you would do in an engineer?"*
>
> *E3: "Exactly, because he has the additional knowledge which theoretically and sometimes practically help him to do his job."*
>
> **[E3: multinational, mixed ownership, manufacturing, electronic machinery and equipment, 1500+]**

Steffy and Maurer (1988, p.277) have also reported on the low cost of training required in the recruitment of highly-skilled and the early contribution to the company. Furthermore, UK employers in previous studies have referred to PhD graduates *'as being able to hit the ground running'* (Jackson, 2007, p.40) or *'up and running quickly'* (Souter, 2005, p.24) reflecting their 'readiness' to add value to a new workplace.

Finally, the PhD was perceived beneficial as previous work experience but only in the case of chemists and by a few Greek employers. This understanding seemed to be connected to the collective agreement – as explained in Table 9.1 – where newly recruited chemists in industry were compensated compared to employees with four years of experience. It is not clear whether this represents of Greek

employers appreciation of doctoral education of chemists or was an accomplishment of the professional association of chemists' negotiations with the industrial sector. However, it is notable that the wage premium of four years' experience is equivalent to the wage premium of the 'studies benefit' of engineers and biologists.

9.4.2 Disadvantages of recruiting a PhD graduate

Apart from reporting on the benefits, employers also commented on the costs of PhD recruitment. In Greek, the word 'costs' [219] is linked to 'expenses' implying financial costs rather than disadvantages. A few Greek-based employers in this study raised the issue of budget considerations when it came to deciding on the recruitment and selection of PhD graduates. In many cases, Greek employers had to pay higher financial compensation to PhD graduates – in relation to other graduates – due to national or occupational collective agreements. This is shown in the chemist example illustrated by an HR representative who stressed the importance of the budget in recruitment considerations:

> *"Regarding the PhD, in some labour agreements, as in the chemists, the salary increases depending on whether you have a degree, a master's or a PhD which would increase it [the salary] even further.[…] So what happens is, that when I want a starter chemist, I would not take somebody with a PhD because he would cost me much more".*

[E9: multinational, Greek owned, manufacturing, cosmetics, 250-499]

[219] The word cost or 'κόστος' in Greek is translated primarily as the expenses or the price for something according to dictionary: http://el.thefreedictionary.com/%CE%BA%CF%8C%CF%83%CF%84%CE%BF%CF%82 ,last accessed 11/02/2012

Another disadvantage from an organisational aspect was the concern about *'internal conflict'* created by PhD graduates being subordinates of less qualified and younger employees but with more professional experience. This was illustrated by the example of the HR manager representing a Greek based branch of multinational management consultancy:

> *"When they finish their doctorate, mainly they are about 30 years old, they don't have other professional experience rather the lab and it is possible that this may create some problem.[…] they have not worked to a completely professional environment. When a person that has done a MBA, he is 26-27, he has worked 2-3-4 years, with more experience. Moreover, regarding the age issue, 30 years old [PhD graduates], it is possible that a PhD graduate will work at the same team where the team leader or the supervisor is 25 years old because the latter finished undergraduate studies in US, and entered the company as associate, progressed to the second level after 2 years, is 24 years old and we are not a hierarchical company and it is possible that somebody [a 30 years old PhD graduate] might not like this".*

[E2: multinational, foreign owned services, business and research activities, 1-50 people (branch)]

The limited exposure of PhD in non-academic business environments inhibited their adjustability in such environments that require business knowledge and skills. Furthermore, PhD graduates were perceive to lack commercial and business awareness as noted in previous employers' studies (McCarthy and Simm, 2006; Purcell and Elias, 2006). Considering that most PhD graduates are following a linear path in their studies (Bachelor - (MA) - PhD) with no work experience in between, this is unsurprising. However, it is envisaged that doctoral training and partnerships between universities and industry – through sponsoring PhDs and providing work experience during this degree – might respond to this challenge. Similar concerns have been identified by studies of UK employers reporting on the lack of commercial awareness, difficulty in adapting to non-

academic work cultures and over-specialization (McCarthy and Simm, 2006; Jackson, 2007; Souter, 2005). A Greek employer commented that PhD graduates have *'bound their professional career'* (E3) with their subject specialisation and were only interested in research posts linked to their PhD topic. This concern was coupled with retention and the internal fight of PhD graduates between an academic career and non-academic career.

For example, Greek-based employers considered applications from PhD graduates for jobs – where less qualified individuals would be able to access – that did not always meet expectations of this highly skilled workforce leading to limited retention. Furthermore, PhD graduates were often perceived as faced with an *'internal fight'*, considering non-academic work as plan B. Therefore, it was crucial for employers to clarify whether the candidates were still considering academic careers. An example is illustrated enquiring on academic aspirations during the interview:

> *"What is your immediate plan? Do you want to do an academic career? If he wants to do an academic career, it is not that you say 'oh dear'. You just want somebody to come and stay, because since they have the knowledge, you don't want to leave this position vacant."*

[E5, private company, Greek owned, manufacturing, pharmaceuticals, 500-999]

Similar concerns were echoed by UK employers in this study. They were more likely to raise concerns about the high risk of retention when PhD graduates were more oriented towards academic careers.

Training had two different sides distinguishing between generalists and specialists. The need for further training was a disadvantage for generalist employers while specialists' employers benefited from PhD graduates' knowledge that did not require training. As a matter of fact, a foreign subsidiary in this study – a generalist employer – operating in Greece highlighted as a disadvantage of PhD recruitment, the resources devoted to training PhD graduates from different disciplines for management consultancy roles:

> *"We are making a tremendous effort to integrate them well and offer them the platform to quickly catch up with all the issues [...] We are doing specific training, we have let's say quickly after they enrol, a training on key financial, meaning to do. For the ones that have done, I don't know, biochemical PhDs, they have no idea on the basics, of course they learn them very quickly, it is not the issue, simply they need somebody to tell them what is happening, so we are doing this kind of training and in addition we are putting them into the x network to have a mentor or a peer or a 'buddy' where they can open themselves and say what kind of difficulties they are facing."*

[E2: multinational, foreign owned services, business and research activities, 1-50 people (branch)]

Despite the cost required to train PhD graduates for generalist roles that were often not of direct relevance to the subject knowledge of the recruits, this company representative reiterated the key role that this workforce played in the organisation. Mandated by the parent company to increase the numbers of PhD holders, it recognised the quick grasp of knowledge and other skills that this qualified group brought to the workplace, justifying the high training cost.

Finally, while many Greek-based employers commented positively on the confidence of the PhD graduates, some perceived this overconfidence expressed by such graduates through their high expectations for higher salary and senior

posts. Employers did acknowledge that PhD graduates had invested time and effort in such a degree but they considered that this might have counter-productive implications in the workplace. An employer commented how overconfidence could become a barrier to PhD recruitment:

> *Interviewer: "In terms of confidence, do you see any difference between the PhD graduates and the master graduates?"*
>
> *E1: "Yes, yes a big one. And especially much more developed in the PhD graduates and there, I would say, I have an objection that they probably should not have to such degree. What I mean is that that although their experience might have helped them to understand some things, I am a bit sceptical regarding the issue of strong confidence because sometimes these people stumble much more easily from the rest who are with a somehow balanced opinion."*

[E1: multinational, Greek owned, manufacturing, defense electronics, 500-999]

This alleged propensity to possess high levels of confidence in their abilities and knowledge seemed to prevent rather than facilitate PhD recruitment. It can be argued that this attitude might derive from limited understanding of the Greek labour market by PhD graduates since their expectations are not in alignment with the needs of the private non-academic sector. Nerad and Cerny (2002) have reported that PhD holders in the US have been ill-informed about working beyond academia arguing that the academic system (administrators and department chairs) was interested in the regeneration of the faculty rather than preparing PhD graduates for non-academic careers. Limited information about the non-academic doctoral labour market has been highlighted by studies in the UK where it was concluded that there was 'no visible point to entry' (Souter, 2005:22) and 'an all too often hidden job market for PhD graduates' (Jackson, 2007:7). Responding to

this criticism, related research and PhD career fairs (Raddon and Sung, 2009) aimed at raising awareness about the doctoral labour market.

9.4.3 Specific targeting of PhDs and PhD tailored approaches

A clear difference between the generalists and specialists was that the generalists did not normally set the PhD as a prerequisite when they advertised vacancies since they were interested in transferrable skills, as reported in previous research (Souter, 2005). Interestingly though, the specialists did not always include a PhD prerequisite either, despite their emphasis on subject specific knowledge. Both Greek and UK HR representatives argued that the PhD was not set as a prerequisite in the job adverts because they did not want to exclude non-PhD graduates who might be appropriate for the post. One Greek-based multinational HR representative stated:

> *"We don't want to limit our search because certainly people have a doctorate, are fewer than those with a master's degree. Thus, we try not to restrict our search. Beyond that, we don't discourage people with a doctorate from sending their CVs and for this reason we leave it open always. And there have been occasions where people with a doctorate applied [...] Because I consider that a person with a doctorate, would probably send it in the hope that he would have a competitive advantage."*

[E1: multinational, Greek owned, manufacturing, electronic machinery and equipment, 500-999]

A few UK-based employers indicated in advertisements that they welcomed interest from PhD graduates. Acknowledging the greater specialisation of PhD holders compared to graduates, one employer reported how they can potentially tailor a post offered to a PhD graduate for mutual benefit:

> *"We don't specify that it needs a PhD, because basically a PhD student can apply for our graduate role and for our experienced roles. They kind of bridge the gap while the graduates could only apply for the graduate roles […] the additional skills that a PhD student has, we then cater that job description a little bit more towards to what it would suit them."*
>
> **[EUK12: multinational, foreign owned, manufacturing, electrical components, 500-999]**

Nevertheless, one key theme from a PhD employers' study by Jackson (2007, p.39) was that *'PhD researchers want to be treated differently and to have their skills and experiences recognised'*. Thus, it was suggested that employers need to adopt different and targeted approaches tailored to PhDs in order to increase their attractiveness to PhD holders.

Both specialist and generalist employers use a number of different strategies, tailored to PhD graduates, such as tailored recruitment approaches (sponsoring PhD students, organising PhD specific events), providing a higher salary to PhDs although entering within graduate streams, having a mandate to increase PhD intake, target PhDs through their corporate website, and contacts with leading professors/disciplinary research groups.

Specialist employers in this study were more likely to use individualised means, such as sponsoring PhD students and establishing contacts with professors to identify PhD graduates that would meet their specialised needs. However, Greek specialist employers only marginally used PhD tailored approaches – individual contacts – probably due to the limited number of specialised posts. UK employers were using these individual methods along with targeting specific universities or research groups to identify future employees.

The generalists had a tendency to use more collective approaches such as organising and attending PhD events at prestigious universities or schools, providing better salaries or tailored training to PhDs acknowledging the differences of PhDs from other graduates. They also communicated though their websites and recruitment brochures the high value that the company attributed to potential applicants with PhD degrees. In this study, these approaches were mostly used by UK based companies and subsidiaries of MNCs in Greece.

For example, a generalist foreign owned, Athens-based employer noted a specific PhD recruitment campaign in cooperation with specific universities. Only a small number of PhD students from each country (where the company had offices) were selected by the HR managers. This suggests that some MNCs invest greatly in developing and running PhD tailored recruitment campaign programmes with the aim of recruiting the 'best and the brightest'. In this process, prestigious universities seem to play the role of 'screening' devices:

> *E2:"We proactively do recruiting campaigns to the big universities that we want to go and from that point beyond, we are open to any applications that people want to do. There are some programmes in England and some programmes also in US, programmes that are specific to those doing a doctorate, which means that we go and we talk to them, using other kinds of information [communication type] because they are interested in other issues and we have customized approaches."*
>
> *Interviewer: "So what do you exactly do?"*
>
> *E2: "Well, we are talking to them about the x track and the network we have, which is not of interest to somebody completing an undergraduate degree from Princeton; we are trying to speak a similar language to them [PhD graduates]."*

[E2: multinational, foreign owned services, business and research activities, 1-50 people (branch)]

A common approach by both specialist and generalist employers was the adoption of an initial higher salary for PhD graduates. Greek specialists' employers in this study were obliged by law to pay higher salaries to PhD graduates due to the existence of collective labour agreements, which may explain why PhDs were less likely to be targeted and recruited. Only a few UK employers of specialists paid a higher graduate premium for a PhD graduate, whereas generalist employers especially in business, financial and professional services had established different entry streams for PhD graduates where remuneration was higher.

It was important to identify whether employer characteristics such as size and ownership had an influence in adopting more tailored PhD approaches. Size and ownership of companies have been generally found to affect recruitment and selection practices in other studies (Galanaki and Papalexandris, 2005; Eb and Smes, 2007). In terms of PhD recruitment, foreign-owned and large UK-based companies in this study were more likely to adopt multiple methods to attract PhD graduates.

All employers adopting PhD specific approaches were MNCs, but when ownership was considered, they were mostly UK and two US. Examining these companies closely, both US-owned companies had stressed the importance of increasing the PhD intake in their workplaces. Interestingly, both –and only among all employers – used the word 'mandate' highlighting that there was a mandate from the headquarters to recruit more PhD graduates. This high emphasis of the

US-owned companies on PhD recruitment led to a more extensive study on the companies that used similar PhD approaches. While the rest of the companies were UK-owned, they had a strong presence in the US with numerous establishments there. It could be argued that this is a coincidence. Nevertheless, the US presents higher R&D intensity and greater share of private sector in R&D activities compared to the EU (Eurostat, 2008; Erken and van Es, 2007) suggesting a more developed and mature doctoral labour market in the US. In addition, the US is an affluent economy with sophisticated management and HRM systems, which have often been imitated in other countries as 'global best practices' especially through interaction of subsidiaries and parent companies (Pudelko and Harzing, 2008; Myloni et al., 2007).

Foreign-owned companies in this study were using more PhD tailored approaches than Greek-owned enabled by collaboration with universities to attract a wide range of PhD graduates across different disciplines. US owned employers in this sample were distinguished for their rather proactive and high cost approach to increase the proportion of PhD graduates in their personnel. Large companies were more likely to employ multiple customised methods simultaneously.

The limited use of PhD recruitment practices by Greek specialist companies reflected only marginal recognition of the potential value of these qualifications. If these organisations are representative of the areas of employment in Greece where PhD graduates are likely to be sought, as it was believed when selecting them, it reinforces the picture provided by research that there is little demand in

the Greek labour market for their skills. Given the small scale of the sample, it cannot be taken to represent Greek PhD employers as a whole, but the structural factors inherent in the Greek labour market for PhD graduates discussed at the outset lend confidence to this analysis. It indicates that a small size doctoral labour market does not facilitate costly and sophisticated PhD recruitment methods while university/industry cooperation appears to have been rather rudimentary as discussed next.

9.4.4 Role of Universities in PhD recruitment

Many UK employers stressed the importance of universities for graduate recruitment. These UK employers, along with a Greek-based branch of a MNC, highlighted their cooperation with a number of universities – often selected on the basis of quality of graduates or prestige – through specific graduate events, such as careers 'fairs'. One reported the 'established relationships' with 15 universities out of which a large proportion of their recruitment was drawn from (E10).

Conversely, employers in Greece only talked about universities when prompted; this revealed that universities did not play such a prominent role in recruitment. Employers in Greece cooperated with universities for advertising and short-term work experience opportunities, such as internships or 'stage' to their students or graduates. Career fairs were often not organised[220] in Greek universities. In some

[220] An exception to this rule was the career fairs that the Athens University of Economics and Business undertook but these events are not found in other universities.

cases employers and universities work together on research projects, but this was not normal practice.

The recent establishment of careers offices in Greek universities coupled with the delay of HRM in Greece and the communication costs in such cooperation have not facilitated close relations between HEIs and employers. For instance, this collaboration is limited to vacancy advertising. Most careers offices were recently established and dependent on European funding, so they are prevented from developing a long-term, sustainable strategy which could potentially lead to further involvement and engagement with employers.

9.4.5 Perceptions about the PhD in the Greek private sector

For Greek employers, the thesis subject of PhD graduates was inextricably linked to occupational choice. This explains not only their reasoning for employing PhDs, such as their specialised knowledge, but also that the doctorate was perceived relevant almost solely for a few highly specialised posts in the private sector. Therefore, primarily linked to academic careers as two employers with PhD recruitment experience commented, the PhD was seen as catering to the needs of the academic sector, as one reported:

> *"PhD graduates in Greece are produced with only one and unique aim, to reproduce the educational system, the university system."*

[E3: multinational, mixed ownership, manufacturing, electronic machinery and equipment, 1500+]

This employer considered that the Greek higher education system did not serve the needs of the business sector, evidenced by the lack of planning to produce

graduates that would be useful to the non-academic sector since many graduates were awarded PhDs in classic subjects. Similarly, another Greek-based employer emphasised how the traditional perception about the PhD as a passport to academic careers has remained unaltered:

> *"In Greece, there is the culture, the mentality that you do a PhD to become an academic, thus the private sector is considered as Plan B. This has not changed the last few years. The doctorate is directly linked to the academic sector since a master is enough to get a good post in an enterprise. 'What are you going to do with a doctorate if you want to work in the private sector?"*

[E6: multinational, mixed ownership, services, telecommunications, 1500+]

PhD graduates in this study also agreed with Greek employers about the perception of the doctorate beyond academia, especially those with professional experience in non-academic settings (Uk2, Uk6, Gr7). They shared employers' concerns about the theoretical character of PhD study and the lack of direct applicability of such a degree. Gr7 discussed the difference between the approach of the graduate and the employer, emphasising the negative perception about PhD holders in business:

> *"Sometimes the subject of a PhD may not be very interesting for an employer […] I do not think that there is much recognition in the private sector because PhDs are considered to be over-specialised and theoretical. For example, in my job, especially from others that have been here for a long time and are ready to retire, I often hear the characterisation that I am a "scientist" but not in a good way. Well, ok, sometimes this might be justified, when for example someone who does not provide the expected results from his project because he invokes or he is not getting the results that the company is interested in. Well, companies do not like such cases. […] What I mean is that the PhD graduate must find a way so that he has practical impact in the job he does, to understand how the company works, be efficient, and make money for the company. My personal viewpoint is very practical; somebody working for a company has to earn his salary somehow. Doing a job that is very theoretical and cannot be applied within the context of the company, it does not help. He*

must find something new, a new process that could be applied, and then be able to implement this [...] When somebody mentions that he has a PhD, there is this perception that he is a bit, he is not that practical or goal driven as the Americans call it, that he lives in his own world.."

[Gr7, male, computer and electrical engineering, deputy director in private company (telecommunications), Greece]

This example suggests that the PhD is purely translated as a theoretical degree with no value in private sector practices. While it is true that PhD study does not have immediate commercial applicability as both Greek employers and PhD graduates argue, other advantages such as fundamental specialist, general skills and personal development seem to be overlooked. The traditional perception of the doctorate is prevalent in Greek society with negative connotations for working in the non-academic sector. Thus, amongst others, the absence of doctoral reforms including skills training and industrial cooperation in Greece obstructs further altering this mentality for the PhDs.

The low demand of the PhD in Greek industry was also highlighted by PhD graduates such as UK6 who explained how the PhD can be an impressive qualification, although not required. In the following, he emphasised how work experience was highly valued, often more importantly than a doctoral qualification:

"The doctorate is not very much demanded in Greece. It is thought as an additional credential and not as a basic credential, at least in commercial sectors such as marketing, etc. It is not asked very much. MBAs are more in demand, in technical.. It might be asked in some research parts that have remained but it is the work experience which is more in demand.[…] Whereas in Europe and abroad, there is this official recognition for the doctorate, in Greece, they emphasise what you can do and what experience you have. The doctorate can only draw attention of people. You are considered expert but you have to prove that you are an expert. Or at least you have to prove that you can utilise

your knowledge. But what basically does, is that it draws the attention of others, therefore afterwards you have to 'earn' them in the work you are doing."

Uk6 also commented on the employers' concern about the high expectations of PhD graduates, attributing such a phenomenon to the structural and labour market conditions of the Greek industrial sector.

"This is true and it is unpleasant. This is simply explained by the fact that PhD graduates pursue specific posts which do not exist in Greece. Abroad, there are research jobs in companies which are similar to the ones in university research departments with less theoretical and more practical orientation. In Greece, there are not many companies like this, a couple of them have such research posts. Therefore a PhD graduate leaving a university research department often finds it quite difficult to make the transition to very practical posts. Indeed, the PhD graduates have immersed themselves into a topic and they are justified to feel important and be demanding. However, the doctorate is not necessarily linked to what the employer asks for and even if you are important in your topic/subject area it might not fit the requirements of the employer [...] It is the mismatch between life and the work world inside universities and the labour market in Greece. If there were specialised posts that require doctorates in Greece, there would be no problem."

[Uk6, male, computer and electrical engineering, Business development executive, private sector, Greece]

In addition, another PhD graduate stressed that there is a general perception in industry that the doctorate is unnecessary. Although PhD graduates could contribute to non-academic settings, negative experiences of employers with such graduates have created an 'unfavourable heritage', a '*stigma'*, as he called it, that all PhD holders carried with them. Similarly, to the account given by the previous respondent, he reported the lack of job opportunities in Greece that could enable PhD graduates to utilise their specialised skills and knowledge:

Phduk2: "There is always the view that in general a PhD in industry is overqualified, and that will always follow us. There is a stigma, if you want. A stigma because we brought it ourselves, meaning that if a PhD graduate is a

very theoretical computer scientist then industry might employ and try him/her out. If people in industry have an experience – which is often the case – where they see that he/she is good in delivering lectures but not able to do work or does not fit, then this is bad for PhD graduates. However, there are brilliant examples where they were very good and from my personal experience most of the people that have gone through this process have got on very well. This is a more general comment for the PhD graduates in the private sector. The stigma of overqualified is very common, it has to do with, they believe also that they are not able to pay them enough."

Interviewer: "Is that a myth or reality?"

Phduk2: "I do not know if this is right or wrong. Industry pays you for what you can offer and not for what you have studied which I personally found fair. For example, if a PhD graduate goes for a secretarial position, I cannot see any reason to be paid more because he/she has the PhD. You have to be paid more only when you can do something that other people cannot do. In Greece, it is true that a PhD graduate would not easily utilise his knowledge in the private sector, right? We don't have R&D, we don't have research programmes, and we have very applied things which anybody could fulfil, well ok not anybody, but somebody who does not need to have a PhD."

[Uk2, male, computer and electrical engineering, product manager, Greece]

Over-qualification is linked to the restricted industry environment in Greece that is unable to offer jobs where a PhD would be useful. Greek employers in this study tended to concentrate on the cost – due to law – of PhD recruitment in roles that did not require a PhD. This also has implications for the deployment of these PhD graduates in the non- academic sector which are discussed next.

9.4.6 Utilisation of PhD graduates in Greece

Structural and labour market considerations in Greece have been emphasised as an important variable limiting career choices of Greek PhD graduates. As reflected in accounts of PhD graduates, there were few vacancies beyond academia that PhD graduates would be interested in applying for, especially when they opted to use their skills and specialised knowledge. This was confirmed by

the few specialised job opportunities that Greek based employers advertised. Moreover, limited opportunities for academic and research posts are decreasing under the current economic conditions in Greece. In addition, Greek PhD graduates are predominantly interested in occupying posts which satisfy their intrinsic needs – as shown in the job satisfaction section – it becomes less likely for these highly skilled workers to be satisfied with their employment and career. For example, Gr14 worked in the academic sector and emphasised his limited employment opportunities outside academia that would enable him to 'fully' use his doctoral qualification. He reported that only a couple of companies in Greece had R&D in his specialisation therefore his career choices were restricted. For this reason, he was more interested in academic jobs to use effectively his skills and knowledge. He highlighted how PhD graduates and new scientists were undermined by the employment opportunities available not recognised by the Greek state:

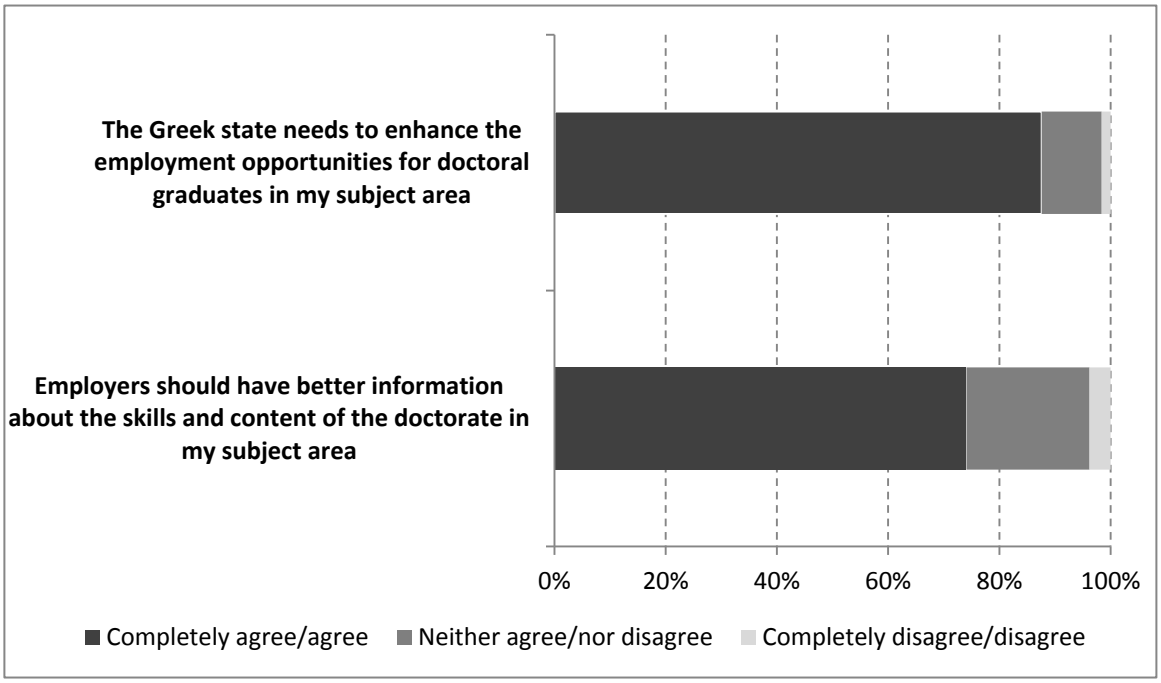
> *"What this country is missing is the utilization of the potential and the reward of human resources economically and ethically with a better professional distinction […] a big proportion of PhD graduates are obliged to work either outside their subject area or with a low hourly pay in HEIs, this is the most obvious example. And these people have publications, many publications."*

[Gr14, male, electrical engineering (microelectronics), professor of applications, Greece]

This understanding was shared by other PhD holders participating in this study reporting how the structure of the Greek labour market outside academia provided obstacles rather than facilitating career development opportunities. Figure 9.1 shows that a high proportion of the survey respondents agreed that a more active

role of the Greek state in expanding doctoral labour market opportunities and a better awareness of employers in terms of doctoral education outcomes was required. This may imply that Greek employers are currently right in assuming that most Greek PhD graduates see the academic job market, managed by the State, as more important to them, than employment in other sectors.

Figure 9-1 Opinions of PhD graduates about the doctoral labour market



An example of the limited awareness of employers towards PhDs was illustrated by Uk2:

> *"Unless if they [Employers] have gone through the process, they have no idea what we are talking about. They don't know how to utilise them [PhD graduates], this is a big problem! Because they might think that if they hired a PhD graduate, wow, what would he do, would he write codes more quickly. This is the big mistake. You don't need to finish university to do this. Simply, in their minds. it is like comparing a builder with the architect and saying "If the builder*

that has not finished school can put so many bricks a day, imagine how many the architect would put, who has finished a university course!."

[UK2, male, computer and electrical engineering, product manager, private company, Greece]

One foreign-educated participant compared Greece to the US to demonstrate the differences not only in size but also in labour market structures, concluding that Greece did not have the favourable conditions to meet career aspirations of young PhD graduates:

"Simply if you know that does not have many posts - for example if you were in US, in Silicon Valley and you had a doctorate you would be in great demand because there are infinite posts that need exactly a doctorate in specific subject areas to produce specific products. In Greece, they don't have so much industry and innovation, we have more transfer an implementation of technology developed elsewhere, meaning that technology comes either from Cisco or from another big company which has created a product somewhere in US or England or somewhere in the world or in China […] and it is transported to Greece. So in Greece it is more important how you are going to sell and promote the product […] It does not create new things which do not exist somewhere else. Or if it does, it does it to the minimum, it is not competitive. And this is logical because it does not have a big market. […] We, here, in x company for example let's say cannot survive only with two Greek telecommunication companies, right? It needs to expand beyond Greece and sell outside Greece, the turnover is of course not the same, therefore our company, as many other companies in Greece, are often forced to produce and develop a few very specific products which are either competitive or not important for other companies."

[Uk6, male, computer and electrical engineering, Business development executive, multinational (telecommunications), Greece]

Uk2 also commented on the incapacity of the Greek state to keep highly qualified individuals pushing them away and preventing them from contributing to its development:

"Unfortunately this country has the tendency to 'kick out' her children and especially the ones that have accomplished something more and instead of utilising them, it has managed to kick out the ones who know things, can accomplish things […] I don't want to use the phrase that the worst stay but it surely does not keep the ones who can take the country two steps further.

> *Because people who have seen, it does not have to do so much with the PhD, it has to do with people who have seen and 'smelled' other countries and other societies and have worked in other environments which are further ahead technological and socially within work [...] however, there is a formalism in Greece, which does not surely help the country progress. Unfortunately, there are very old perceptions and this is mirrored also in the extent that they allow the country to proceed further, they have difficulty in integrating people with new ideas, new technologies, new things and utilise them and go a step ahead."*
>
> **[UK2, male, computer and electrical engineering, product manager, Greece],**

To sum up, the evidence from the employers and the PhD graduates employed in Greece indicates that PhD graduates are confronted with rather unfavourable labour market conditions in Greece if they are interested in pursuing a career in the Greek private sector. The small size of the doctoral labour market is confined to a few specialist posts where the PhD has to be accompanied with employability skills. While Greek employers in this study acknowledged the importance of doctoral qualification as the highest level of knowledge, providing expertise to its holders, they still perceived the PhD as an academic qualification that did not fit with the interests or the posts that the company could offer. Liagouras et al. (2003) had suggested that systemic factors explain this inability of the private sector to deploy these highly skilled personnel. This study shows that this inability persists together with the limited awareness about PhDs. Furthermore, this evidence suggests that the current situation of the doctoral labour market in Greece is rather unfavourable considering the current economic crisis and the risk of migration of this highly skilled workforce as reported in other studies (Labrianidis, 2011).

9.5 Conclusions

In the non-academic sector, it was found that most companies operating in Greece were recruiting PhD graduates for specialised posts on a one-to-one basis. However, they did not always set the PhD as a requirement for the vacancies advertised, and made limited use of PhD tailored recruitment approaches. This is in-line with the evidence on wider HRM practices in Greece where domestic companies were less likely to use sophisticated recruitment practices than foreign subsidiaries. This attributed greater importance to recommendations and contacts as recruitment approaches of personnel. While the role of the universities in graduates' recruitment was limited – especially compared to the UK – there were cases of HR and R&D representatives being in close contact with university research groups and departments.

The majority of the UK-based employers – along with a Greek-based branch of a foreign owned company – were more likely to recruit PhD graduates for generalist posts compared to their Greek counterparts, valuing the high skills and competences that these graduates brought in the workplace. Various PhD tailored approaches – mainly collective methods such as PhD events, PhD campaigns and career fairs – were employed by this group often in cooperation with selected universities which were used as proxies for excellence. There was evidence of US companies being 'ahead in this game' in terms of PhD recruitment in comparison to their UK counterparts but further research is required.

In terms of benefits, both Greek and UK employers commented on the personal traits of PhD graduates, such as their maturity, career focus and professional aspirations. However, Greek employers, although specialists, were less likely to specifically mention traditional academic skills of PhD graduates as UK employers did. While most employers acknowledged the significance of the doctorate, they considered soft skills such as communication, team working and leadership skills, as equally important. Comparing the views of employers on the benefits and the PhD graduates' perceptions about skills development during doctoral education, it was concluded that there was a similar pattern between the Greek-educated – Greek employers and UK-educated – UK employers. This might suggest a reconstruction of the characteristics of the higher education system in the respective labour market. Greek-educated PhD graduates focused on their specialised knowledge and subject specific skills, which was the predominant advantage of PhD holders according to Greek employers. In addition, domicile educated PhD holders valued their doctoral education in relation to their personal development, which was also noted by employers. The UK-educated PhD graduates along with UK employers were commenting on personal traits, but they also highly regarded the traditional academic skills developed during the PhD, such as critical thinking, analysis and problem-solving skills. Nevertheless, almost all UK-educated thought that they had advanced transferrable skills, such as presentation and communication skills especially in addressing different audiences, which was only marginally reflected by UK employers.

In terms of costs, the main difference between Greek and UK-based employers was that the former were often obliged by law to provide extra financial benefits to PhD recruits. Employers in this study – irrespective of country – were concerned about overspecialisation, over-confidence, lack of business acumen and experience, and the likelihood of retention in the light of assumed lack of commitment to the business sector. Within the Greek economy and industry, there is a resistance to the wider dispersal of this highly educated workforce in all kinds of specialised posts. The lack of collaboration between universities and employers has not facilitated this process.

Different perceptions of Greek-educated and foreign-educated PhD graduates have also been explored. The majority of the participants could not identify big differences between the two groups but half of them – mostly MNCs with activities beyond Greece – preferred foreign-educated PhD graduates for jobs that required living or travelling often abroad. This was also in-line with the perceptions of PhD graduates who were interviewed in this study.

Finally, Greek employers and PhD graduates working in the private sector agreed that the theoretical character of doctoral training made it an inappropriate training and preparation for a business environment. The traditional perception of the PhD as an academic qualification seems to persist in the private sector being interpreted solely as specialised knowledge meeting needs of specialised posts that may not be available in the business sector. Coupled with this perception, PhD graduates also discussed their underutilisation attributed to systemic factors

of the Greek labour market such as the small size, the low demand for highly skilled, supporting previous research findings. The current rather gloomy economic climate of Greece is likely to exacerbate the inability of the Greek non-academic labour market to utilize part of its highly skilled workforce, reinforcing the likelihood that there will be few new non-academic employment opportunities for PhDs in the foreseeable future. This situation coupled with the lack of academic vacancies in the country could lead to highly skilled migration and brain drain as the Greek media have already reported.

Chapter 10 CONCLUSIONS

This study reveals the impact that institutional forces and cultural constraints can have on the career development of PhD graduates. Contrary to the expectations provided by human capital theory, an investment in a doctoral education might not necessarily yield the expected returns for both the individual and society/labour market. This study focuses upon the case of Greek natural sciences and engineering PhD graduates after a long educational investment (higher education with first degree, masters, PhD). Greek PhD completers invest even further in quite uncertain temporary teaching and research posts before they can access a more permanent post and get their returns to investment. Apart from individual insecurity, this has implications for research productivity that affects not only the individual, but also collective returns. Considering that Greek doctoral education is free to the student at the point of consumption, investment in doctoral education might not represent an optimal decision, especially when the potential of this highly skilled workforce is not utilised to the maximum.

Based on human capital theory and the links between educational attainment, productivity and economic growth, policy makers in the 21st century (such as outlined in green papers and European policies) have focused on expanding higher education and increasing the number of highly skilled workers to benefit the economy (regardless of the potential societal benefits). However, this study provides evidence of an absence of systemic factors (such as poor research

infrastructure, low demand for highly skilled workforce, limited R&D sector) that are required for individuals to fulfill their potential and for the country to utilise this highly skilled workforce.

This research has explored and analysed: the different experiences of PhD graduates related to the location of their study and country context (defined by labour market, funding opportunities, vacancies, networks and mobility); how these differentiated experiences have impacted on early and mid-career paths in the Greek context; the early career paths of Greek PhD graduates; the skills and experiences that have led to a 'successful' academic career (such as research and teaching experience, informal networks, reputation of institution and internal contacts); plus the atypical early career paths of graduates in the Greek private sector.

In Greece, the growing number of postgraduates, PhD graduates, and more broadly the research workforce, have been acknowledged as having a positive impact on national research and innovation in the labour market. The Greek academic and public research sector is dominated by legal frameworks. Vacancies are planned on the basis of agreement between universities and the Ministry and are dependent on available funding from both national and international sources. This study has shown that the doctoral labour market in Greece has three main sectors: academia; governmental research and wider public sector; and the private business sector, which is comparable to other EU countries. However, Greek PhD graduates were found to be mainly employed in

the higher education and public research sectors reflecting the high share of R&D expenditure and performance in these sectors. Conversely, fewer PhD graduates were employed in the Greek private and public sectors.

Careers in Greek academia and implications for prospective PhD researchers

The majority of Greek PhD graduates in their subject areas studies aspired to an academic or research career. Most, who aspired to develop this career in Greece, followed the typical path presented in chapter six. According to this path, new graduates undertake temporary teaching and/or research posts – often more than one in different institutions – to enhance their skills and networks and become eligible for a more permanent academic and research post. This early career building experience is characterised by high uncertainty and precarious working conditions since these posts are temporary, on a project basis rather than fixed-term contracts. The career development of the study participants was further obstructed by the Greek academic system allegedly characterised by nepotism, lack of meritocracy as well as a lack of infrastructure and sustainable funding. On the assumption of an instrumental approach to doctoral education, PhD graduates aimed at better academic employment in financial and non-pecuniary terms. However, this study has found that after this long investment in their education, further investment in accumulating research and teaching experience early in their career, which could only potentially lead to a more permanent post and subsequent career progression was invariably required.

At individual level, this study suggests that Greek science and engineering students wishing to enhance their employment prospects in the Greek labour market should be aware that obtaining a PhD may not provide such opportunity. For an academic career in Greece, research excellence is important, but it is not the only precondition to access a more permanent post. Labour market considerations, timing of opportunities, access to appropriate networks, long-term commitment and patience in undertaking temporary employment in the early career path are also necessary. This research has also shown that there was a greater effect of the country of doctoral education on academic career paths in the Greek context. UK-educated returnees in Greece drew attention to how the academic reality that Greek-educated confronted, when combined with limited internal contacts and informal networks were posing additional career obstacles that the Greek-educated could use to their advantage. Although most UK-educated doctoral students had invested more financially and personally (being away from home, etc.) in studying at prestigious institutions abroad, this mobility experience seemed to be penalised instead of being acknowledged and welcomed by the Greek academic system leading them, often reluctantly, to follow non-academic paths. This raises questions about how far high investment to foreign education can be justified, in the light of the limited use of PhD knowledge and skills and the satisfaction of UK-educated returnees in this study. In particular, prospective PhD researchers should examine carefully the option of going abroad for doctoral studies if they intend to return to Greece after their degree. The utilisation of this highly skilled workforce with exposure to a well renowned

academically and more advanced technologically community was rather limited, together with the missed opportunity of knowledge transfer to the Greek education system.

One of the mediating mechanisms that alleviated this situation was the development of networks within the Greek academic circles whilst studying abroad and, for the most successful, access to international careers. Such UK-educated respondents perceived that it would be easier to access the Greek academic system in their mid-career stage when they would be more established and would be in a stronger position to negotiate the conditions of their post. In addition, the effect of foreign doctoral education when combined with doctoral education experience might be greater and more beneficial at a later career stage according to the PhD graduates in this study. Establishing a successful academic career abroad and scholarly reputation can positively affect the integration of foreign-educated in the Greek academic labour market at a mid-career stage.

However, the effect of country of doctoral education was limited for doctoral students interested in pursuing a global academic career on completion of their PhDs. High achieving PhD graduates from both Greek and UK universities appear to have been equally able to pursue a global career in prestigious institutions.

In terms of determinants of career paths, the ‘organisation of research’ – linked to institutional choice and country of doctoral education – affected career choices

especially in terms of funding and doctoral training (as shown in chapter five). A consistent pattern was observed between industrial funding (in the UK) and/or non-academic employment experience during the PhD and career paths of the study participants in the private sector. Prospective doctoral researchers interested in combining doctoral degrees with industrial funding and potentially work experience are more likely to find such funding sources in UK rather than Greek universities and this situation is likely to continue, given the current economic situation.

Evidence also demonstrated – although less clearly – that there was a link between doctoral scholarships and academic paths. Having sufficient funding for doctoral research was considered paramount by respondents of this study so as not to jeopardise the quality of research and the subsequent career progression in academia. UK educated were often sufficiently funded by scholarships that met their financial needs, while Greek educated had to combine different funding sources including self-funding – and manage a variety of part-time posts – to supplement their income.

In addition, this research suggested that the relationship between doctoral supervision and access to academic career paths was strong in the Greek context, which is also evidenced by the dominance of the master-apprenticeship doctoral education model and the lack of structured PhD programmes in Greek universities, to a greater extent than more widely because of the importance of sponsorship and networks. This also has implications for the skills development of

Greek-educated PhD graduates, which are increasingly emphasised in the doctoral education agenda for preparation on careers beyond academia, as it is the case in the UK.. Therefore, prospective PhD researchers should carefully consider and select funding and supervision during doctoral education – irrespective of type – since they were found to play an important role in doctoral education outcomes and career choices of Greek PhD graduates.

Nevertheless, according to this study a PhD should not be considered as a qualification with the sole aim of opening new career opportunities or of generating a good return on investment in education. The completion of a doctorate provided social and professional status enabled the development of relationships with distinguished scholars, the enhancement of transferrable skills and personal effectiveness, while it increased the self-awareness and maturity of study participants.

Careers in the non-academic sector and implications for prospective PhD researchers

Less typical career paths of Greek PhD graduates were characterised by employment in the public or private sector. The discipline studied played a critical role and was an important determinant of career paths irrespective of country of doctoral education as illustrated in chapter eight. Biological sciences and engineering were among the most popular areas for Greek PhD graduates both in Greece and UK, as demonstrated by the statistics and the proportion of these groups in this study. This might reflect the wide range of employment opportunities that these disciplines give access to and suggest that the PhD

investment in these scientific fields mirror an instrumental approach towards doctoral education. The prestige and employability of the engineering profession in Greece persists at first degree as well as PhD. But, it was shown that the doctorate provided an significant advantage for qualified engineers especially in periods when related sectors emerged or developed (as for example in telecommunications and the creative media sectors). The favourable career options of engineers were also demonstrated by the limited career-led migration of PhD graduates to overseas jobs in engineering after their PhD. In contrast, evidence from the PhD graduates from biological sciences confirmed findings of academic careers in biology worldwide, requiring multiple postdocs and research posts after the PhD, including experience from the US, who are seen to be at the forefront of research in this discipline.

The non-academic trajectories in this study revealed that Greek PhD graduates experienced difficulties in combining jobs in the non-academic sector that would enable them to use their PhD knowledge and skills. This reality was also reflected in the accounts of Greek employers who recruited doctorate holders for a few specialised posts. This is not surprising considering the limited share of the business sector in R&D activities in Greece.

From the individuals' perspective, it was found that returns to PhD study in the private sector were rare since the doctorate was rarely required or utilised in the non-academic workplace. PhD graduates in this sector reported lower satisfaction with the intrinsic aspects of their employment. It could be argued that these

participants might have valued the extrinsic job aspects more when choosing non-academic jobs. However, the qualitative data indicated that participants working in this sector considered and acknowledged the difficulty of academic posts in Greece in their career choices and followed these paths despite their desire for PhD-related or challenging work, which were sometimes achieved in their second job. In those cases, the PhD seemed to offer a small competitive advantage over less qualified graduates for such employment, but more importantly, appeared to contribute to personal rather than professional development.

Therefore, if a prospective doctoral researcher is interested in a PhD-relevant, non-academic career in Greece then he/she also needs to be aware that there are limited opportunities in the Greek labour market to obtain employment in a post relevant to his/her subject specific knowledge. There are currently few specialised posts in the private sector that require a doctorate and Greek employers perceive the doctorate as a qualification with little relevance outside academia. Given the emphasis that employers attributed on the skills of employees, it is recommended that doctoral candidates should acquire work experience and develop transferrable skills (e.g. communication, teamwork, leadership) during their studies to increase the likelihood of success in a non-academic career.

Is there a doctoral labour market beyond academia in Greece?

It is, thus, established that there is a limited doctoral labour market in the non-academic sector, which only marginally utilised the potential and the expertise of

this highly skilled pool of graduates (as shown in chapter eight and nine). Many obstacles in further development of this market were identified, not only in terms of systemic considerations (e.g. small size of the Greek market, dominance of SMEs, the weak national research and innovation system, and strict employment legislation), but also inherent characteristics of Greek firms. The lack of sophisticated management and human resource practices, the limited interest of Greek companies in research and innovation with a tendency to adopt and transfer technology, sell/promote products rather than create and developed products domestically (as illustrated in examples of pharmaceuticals and biotechnology) have further obstructed the development of such a doctoral labour market in Greece. Further obstacles were identified in the limited cooperation of these firms with Greek universities, coupled with: the partial awareness of the potential benefits of employing PhD graduates; the persistence of traditional perception regarding the doctorate as too theoretical raising concerns about PhD recruitment; and the absence of any targeted approaches towards this skilled workforce.

These barriers were highlighted by a comparison of the Greek private sector with more mature and well-developed labour markets, in terms of PhD graduate employment, such as the US and UK (chapter nine). More favourable systemic conditions in these countries (including a higher share of R&D in the private sector , more flexible labour market systems, plus larger markets) and characteristics of firms (such as a focus on innovation and technology intensive activities, close

cooperation with universities and strategic management practices) showed that firms in the US take a more informed approach to PhD recruitment compared to UK counterparts and, of course, Greek employers, who are slowly moving towards a more developed doctoral labour market.

On the basis of this investigation, it is evident that Greece is investing in education and 'ideally' the development of high calibre scientists, but it is not able to offer the career development or progression (based on performance) justifying their investment. Apart from the overall underutilisation of this highly skilled workforce and the limited returns to investment, this education enables PhD graduates to move abroad to fulfill their potential and gain returns on their investment (especially during the current economic climate) and the lack of opportunities makes it more likely that they will do so. This study also implies that in the Greek case, the supply of highly skilled workforce in the absence of a demand for this workforce does not seem to drive research, innovation and subsequently economic growth as might be envisaged by policy makers at a national and European level.

Based on the qualitative findings of this study, a career typology of participants was presented considering the role of the doctorate in the career trajectories, the career choices and their determinants (chapter seven). Although the sample of interviewees was small, this typology is suggestive of how the doctorate, in combination with personal and contextual characteristics, can lead to various 'careers': the global innovator with a career mission beyond geographical borders;

the Greek academic, satisfied to develop a career within the constraints of the national labour market; the highly-skilled professional who had realised the value of having an advanced set of skills for non-academic professionals; and the less satisfied, a minority who were or felt themselves to be under-employed.

Implications for Ministry of Education and senior staff of HEIs

Since Greek HEIs are under the supervision of the Ministry of Education, the implications and suggestions of this study are overlapping for the senior staff of HEIs and the Ministry.

In terms of doctoral education, officers at the Ministry of Education in cooperation with senior staff of HEIs need to reconsider doctoral education in Greek HEIs and introduce appropriate structures for Greek doctoral education to meet the needs of individual doctoral candidates and potential employers considering doctoral reforms in other countries, which entail skills' development and industry-university collaboration.

More specifically, there needs to be a reconsideration of the structure and organisation of doctoral education in Greek HEIs. The master-apprenticeship model has been criticised for prolonged completion, since it is loosely regulated by internal institutional regulations or national legal frameworks. The introduction of clear and specific supervision guidelines, supervision training and more effective and systematic monitoring of the process, time-management and quality of PhD education and performance needs to be considered. The general absence

of organisational and structural management of Greek doctoral education poses obstacles to the development of a doctoral community that would enable exchange of ideas and inter-disciplinary collaboration, foster development of transferrable skills for those graduates interested in employment within and beyond academia and alleviate intellectual isolation.

If the enhancement of Greek intellectual productivity and increase of innovation is a priority, to support PhD research it is of paramount importance to introduce a national research programme tailored to the needs of the Greek economy with a dedicated research budget aiming at supporting doctoral researchers and PhD graduates in their early career paths. The insecure doctoral and early career experience of PhD graduates in this study suggests implications for research productivity that affects not only individual, but also collective returns of the country. Considering that Greek doctoral education is free, investment in doctoral education might not be as well justified especially when the potential of this highly skilled workforce is not utilised to the maximum.

Furthermore, senior staff at HEIs and the Ministry of Education should consider the integration of careers services in the institutional budget and strategy of HEIs rather than operate as an autonomous service in university premises. Career centres have a significant role to play in connecting non-academic employers and doctoral researchers and raising awareness of the benefits that PhD recruitment entails.

The Ministry and HEIs need to ensure that transparency and meritocracy are routinely practiced in recruitment procedures for academics posts, as reflected in legal frameworks, to hire the best candidates for the medium to long-term interests of the department and the institution.

At policy level, considering the lack of a consistent education and research policy, it is increasingly important that the Ministry of Education should cooperate with relevant Ministries responsible for research policy and development policy to plan a long-term policy that would restructure higher education and research policy in a way that would consider the supply and demand of doctoral researchers for the benefit of the Greek economy.

As noted earlier, the overall Greek state and higher education institutions have benefited from European funding – through the structural funds and framework programmes – in the short-term injecting resources for research, creating a demand for specialised personnel (e.g. MA and PhD students, research assistants and postdocs) especially in the academic research sector. Nevertheless, boosting the supply of highly skilled workforce seems not to be a sufficient condition for economic growth in the Greek context. Increases in supply need to be complemented by demand conditions that would enable the deployment and effective utilisation of this workforce contributing to economic development. In addition, the short-term financial injections from the EU do not seem to be integrated into long-term strategies (from the Greek state) and have largely been shaped by EU priorities rather than national interests. Therefore, the

Ministry and public sector officials need to ensure that European funding is utilised efficiently in accordance with national priorities and the development needs of the Greek state.

First, there is a need for a national mechanism and related policy, which can integrate these programmes into a long-term sustainable policy for research and innovation in Greece that would be aligned with national priorities rather than EU priorities. Second, the creation of a national sustainable fund for PhD graduates would contribute to a future viable doctoral labour market and maximise the potential beneficial effects of these programmes in the long-term, enabling PhD graduates to maximise their returns from investment in doctoral education. Moreover, a national fund would be an important precondition as well, for the skills development of PhD graduates in line with other EU countries, preparing them for multiple careers. At the same time, such an action will minimise the risk that these funds entail in creating temporary needs and demands in terms of highly skilled personnel, injecting the Greek labour market with personnel that cannot be absorbed elsewhere if these funds are not sustainable. These EU programmes have a greater influence on academic rather than on non-academic paths especially in terms of creating temporary research posts for PhD candidates and graduates within universities and research institutions in Greece.

Finally, it is recommended that the Greek state should proceed with a number of policies to exploit this competitive advantage, such as: identify and invest in the Greek private sector especially in niche and highly productive sectors that can

boost the Greek economy and absorb a highly skilled workforce; undertake a long-term consistent research policy fully fledged with higher education and industrial policy; and monitor and carefully plan the pool of doctoral candidates and researchers on the basis of the country needs and not on availability of EU funding.

Implications for Senior EU policy makers

The European Union has put increasing emphasis on the mobility of researchers and Human Resources in Science and Technology to overcome research fragmentation in Europe by establishing scientific clusters of excellence increasing European competitiveness. Nevertheless, this study showed that mobility for doctoral research can entail personal and career-developmental costs and disadvantages, for researchers this varies according to disciplinary and geographical contexts. Thus, the EU needs to ensure that member states integrate mobility incentives and professional safeguards in the career development of researchers, in recognition that international mobility requires a great personal and financial investment from the individual researcher and that they can positively contribute to the economy.

European studies have focused on identifying patterns, flows, trends, motivations and barriers for mobility of doctoral candidates and early career researchers, but there is limited information on the benefits and impact of such programmes that aim to promote researchers' mobility. There is a need to conduct further studies to

explore whether the potential value of mobility is justified at individual and/or collective terms for investing EU taxpayers' money in such activities..

Further research

The doctoral labour market in Greece has been overlooked despite its importance in stimulating research and innovation and subsequently economic growth. Although this study provides new information in-line with the quantitative information of the GSRT, it also enriches the available, but limited, information with qualitative accounts to better understand the contextual background of these career paths and how they are shaped. Nevertheless, this study was limited in scope and further large scale research could be undertaken to confirm findings. More specifically, it would be useful to employ a mixed methods study to compare career paths between different disciplines and not just natural sciences and engineering, in order to explore the differences and similarities in their career paths. For such a purpose, a large-scale survey would be more appropriate compared to the limited resources of a PhD degree Although such a study might be challenging in terms of identifying employers, such as for arts and humanities PhD graduates, it would provide an overall picture of how the natural sciences and engineering compare to disciplines considered less linked to the business world. A larger study on Greek employers would also be beneficial to investigating the bigger picture of PhD recruitment in Greece and the added value of the PhD workforce through self-reported accounts, but also accounts of co-workers, line managers and recruiters. In addition, more research would enable

an improved understanding of the differences in the careers of Greek-educated and foreign-educated in the Greek labour market at all graduate levels. Finally, further research is required to explore the medium and long-term career paths of PhD graduates identifying whether the effect of determinants in early career choices (e.g. country of doctoral education) is increasing or decreasing in the later career development.

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APPENDICES

Appendix I: Questionnaire of the online survey

Early career paths of Greek doctoral graduates

This survey aims to explore the early career paths of Greek doctoral graduates in Science and Engineering (S&E) who have completed their studies in UK and Greek Universities

Section A: Doctoral education

Month and year of doctorate award

A1. **Month**

A2. **Year**

A3. **In which country did you earn your doctoral degree?**

- *Greece*
- *UK*
- *Other, please specify below*

A4. **Which institution awarded your doctoral degree? (*Please select your institution from the drop down menu)***

A5. **Which UK institution awarded your doctoral degree? (*Please select your institution from the drop down menu)***

A6. **Which is the main discipline (s) of your doctorate? (*e.g. Chemical sciences, if multidisciplinary then please tick 2 or 3 main disciplines, if you put the mouse over the answers you will find more information on the subject areas included within these scientific fields*)**

- *Mathematics*
- *Computer and information sciences*
- *Physical sciences*
- *Chemical sciences*
- *Earth and environmental sciences*
- *Biological sciences*
- *Other natural sciences*
- *Civil engineering*
- *Electrical engineering, Electronic engineering, Information engineering*
- *Mechanical engineering*
- *Chemical engineering*
- *Materials engineering*

☐ *Medical engineering*

☐ *Environmental engineering*

☐ *Environmental biotechnology*

☐ *Industrial biotechnology*

☐ *Nano-technology*

☐ *Other engineering and technologies*

☐ *Other*

If other, please specify below

A7. **Please specify the area of doctoral study *(e.g. Analytical chemistry, if discipline : Chemical Sciences)***

When did you start your doctorate? ***(Please choose the month and year)***

A8. **Month**

A9. **Year**

A10. **How did you fund your period of doctoral study (including fees and subsistence costs)?** ***(Please tick all that apply)***

☐ *Award from the institution where I studied*

☐ *EU/EC funding*

- [ ] *UK Research council funding*
- [ ] *Other UK or international competitively-awarded scholarship or award*
- [ ] *Greek Scholarship/Awards foundations*
- [ ] *Support from my employer or an industry body*
- [ ] *Earnings from teaching*
- [ ] *Earnings from research*
- [ ] *Earnings from employment related to my area of research*
- [ ] *Earnings from employment not related to my area of research*
- [ ] *My savings or the support of my family or partner*
- [ ] *Other (please write in below)*

A11. **Why did you decide to undertake the research degree? (P*lease tick all that apply*)**

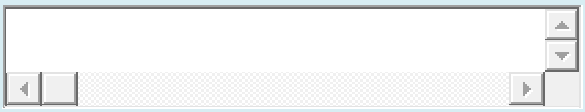
- [ ] *I was interested in the subject*
- [ ] *I wanted to do a PhD*
- [ ] *I wanted to go on being a student*
- [ ] *I wanted to postpone job hunting*
- [ ] *I was awarded a funded scholarship*
- [ ] *I was encouraged or required to do so by my employer at the time*
- [ ] *I was encouraged to do so by previous tutors/lecturers*

- ☐ *I wanted an academic career*
- ☐ *I thought it would improve my career prospects more broadly*
- ☐ *It was essential to get into the area of employment I want(ed) to work in*
- ☐ *Other, please specify*

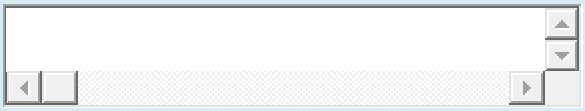
A12. Why did you choose to undertake your doctoral studies at the university or research institute where you did it? (*Please tick all that apply*)

- ☐ *I wanted the best quality education in my area of study* 01
- ☐ *I particularly wanted to study at that institution* 02
- ☐ *I wanted to get the best provisions in research experience in my area of study* 03
- ☐ *I found exactly the course/ combination of subjects I wanted to study* 04
- ☐ *I wanted to study at an institution with an international reputation in my area of study* 05
- ☐ *I thought that with a degree from my University I would have better job prospects in the Greek labour market* 06
- ☐ *I thought that with a degree from my University I would have better job prospects in the global labour market* 07
- ☐ *My preferred course was not available in Greece* 08
- ☐ *'Logistics' were much easier than alternative options (no visa requirement, EU country, not far from Greece, language advantage, etc)* 09
- ☐ *I wanted to experience foreign academic communities* 10
- ☐ *I had studied or I have spent some time in the UK in the past (mobility programme, degree undertaken)* 11
- ☐ *Other* 12

Please indicate other reasons not mentioned above



Which one was the most important reason from the above? Please indicate the code value



A14. To what extent did your research topic require..?

	A great extent	*To some extent*	*Not at all*
a. Working on your own	○	○	○
b. Collaborating with others in the same broad discipline	○	○	○
c. Collaborating with others in different disciplines	○	○	○
d. Development of knowledge and skills that cross other disciplines/subject areas as well as your own	○	○	○
e. Communication with others outside the research community	○	○	○
f. Increasing specialisation	○	○	○

Section B: Current situation/Employment

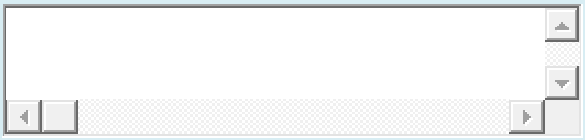
B1. What is your current situation? (*please tick your main activity, if you have more than one activities*)

○ *I am employed full time*

○ *I am employed part time*

- *I am self-employed or freelance*
- *I am working in my family business*
- *I do voluntary work/other unpaid work*
- *I am unemployed and looking for work*
- *I am doing something else (travelling, maternity)*
- *Other*

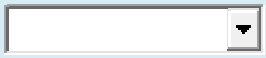
If other, please specify below



When did you start the work that you have now? *(Please indicate month and year for main job if you have more than one)*

B2. **Month**

B3. **Year**



B4. **In which of the following sectors is your current job? (*Please tick only one option*)**

- *Agriculture, mining,quarrying (includes oil and gas extraction)*
- *Manufacturing*
- *Utilities (electricity, gas, water supply)*

- *Construction (includes civil engineering)*
- *Distribution, hotels, catering (includes supermarkets, wholesale or retail distribution)*
- *Transport and tourist services*
- *Information and communication sector (includes media)*
- *Banking, finance, insurance*
- *Real estate activities*
- *Business services (includes legal services, computing, advertising, public relations, R&D)*
- *Professional scientific and technical activities*
- *Administrative and support service activities*
- *Education*
- *Other public services (local or central government, health services, police, social services)*
- *Other, please specify*

B5. **In which type of the following organisations are you working in?**

- *Higher Education Institution*
- *Research Institute*
- *Public service*
- *State enterprise*
- *Private enterprise*

Private non for profit foundation

Multinational enterprise

Other, please specify

B6. Where is your workplace?

a.Town/City/Area

b. Postcode

c. Country

B7. What is your job title?*(Please also indicate if this is a postdoc)*

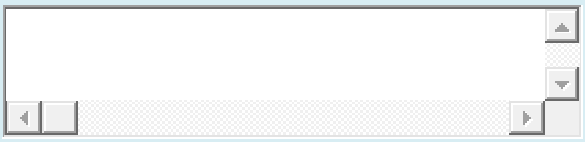
B8. Please briefly outline your main duties as appropriate.*(Please be as specific as possible including any area of specialisation. e.g. specialised in geotechnical engineering, taught engineering and conducted research)*

B9. Which of the following best describes the basis on which you are employed?

On a permanent or open-ended contract

On a fixed term contract lasting more than 12 months

- *On a fixed term contract lasting less or 12 months*
- *On a project-based contract*
- *Self-employed/free lance*
- *Temporarily, through an agency*
- *Employed on another basis, please specify below*



B10. **Approximately how many people work in the organisation? (*i.e. all branches, departments, etc*)**

- *1 to 49*
- *50 to 249*
- *250 or more*
- *Don't know*

B11. **What is your approximate monthly gross pay before tax? (Please convert to Euros if you are paid in another currency. *If you were self employed, please indicate the amount of money that you paid yourself out of the business. Please just state basic pay; do not include any bonuses or benefits in kind.)***

- *less than 500 € (Euro)*
- *501- 750 € (Euro)*
- *751-1.000 € (Euro)*
- *1.001-1.250 € (Euro)*

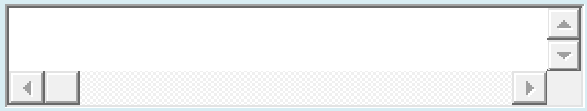
- *1.251-1.500 € (Euro)*
- *1.501-1.750 € (Euro)*
- *1.751-2.000 € (Euro)*
- *2.001- 3000 € (Euro)*
- *3.001-4000 € (Euro)*
- *4001-5000 € (Euro)*
- *More than 5000 € (Euro)*
- *Don't know/No answer*

B12. **As far as you are aware, which of these factors were important to your employer when you gained this employment?** ***(Please tick the appropriate level of importance for each factor)***

	Formal requirement	*Important*	*Not very important but helped*	*Not important*	*Don't know*
The type of qualification you obtained (PhD)					
The subject you studied					
Evidence of skills and competencies					
Relevant work experience from previous employment					

B13. **How did you find out about this job?**

- ☐ *Careers service at the institution at which you studies/or its website*
- ☐ *Through employer's website*
- ☐ *Newspaper/magazine/website*
- ☐ *Recruitment agency office or website*
- ☐ *Already/previously worked there*
- ☐ *Professional work or educational contacts or networks*
- ☐ *Personal contacts, including family, friends and social networks*
- ☐ *Speculative approach to employer*
- ☐ *Participation in public competition*
- ☐ *Other, please specify below*



B14. **Why did you decide to take this job? (Please tick all that apply)**

- ☐ *It fitted into my career plans*
- ☐ *It was exactly the type of work I wanted*
- ☐ *It was the best job offer I received*
- ☐ *It was an opportunity to progress in the organisation*
- ☐ *To gain experience in order to get the type of job I really want*

- [ ] *To see if I would like the type of work it involved*
- [ ] *To broaden my experience/to develop general skills*
- [ ] *It was within my family run business*
- [ ] *In order to earn a living*
- [ ] *The salary level was attractive*
- [ ] *I wanted to work in this region*
- [ ] *Other, please specify*

B15. **How satisfied are you with the following aspects of your current job?** ***(1- not satisfied at all, 7- completely satisfied)***

	1	*2*	*3*	*4*	*5*	*6*	*7*
a. Salary (including overtime or bonuses)	○	○	○	○	○	○	○
b. Promotion prospects	○	○	○	○	○	○	○
c. Job security	○	○	○	○	○	○	○
d. Interesting tasks	○	○	○	○	○	○	○
e. Independent work	○	○	○	○	○	○	○
f. Relations with your supervisor/ Working environment	○	○	○	○	○	○	○
g. Meeting career goals	○	○	○	○	○	○	○

h. Life-work balance							
i. Relevance with your doctoral education							
j. Working hours							
k. Location of employment							
l. Status of employment							

B16. **In this job how often do you/did you..?**
(Please tick one option for each row)

	Most of the time	*Some of the time*	*Occasionally*	*Not at all*
a. Conduct research				
b. Interpret research data				
c. Critically evaluate research findings				
d. Draw on the detailed knowledge on which your research degree was based				
e. Use your general disciplinary knowledge				
f. Use the research skills you developed as a research student				
g. Use the generic skills you developed as a research student				
h. Work autonomously				
i. Work as part of a team				
j. Work under close supervision				

k. Have responsibility for supervising the work of other				

B17. **To what extent has your doctorate experience enabled you to.. ?**
(Please tick one option for each row)

	A great extent	*Some extent*	*Not at all*	*Don't know*
a. Be innovative in the workplace				
b. Make a difference in the workplace				
c. Access immediate or short term job opportunities in your chosen career				
d. Progress towards your long term career aspirations				
e. Enhance your social and intellectual capabilities beyond employment				
f. Enhance the quality of your life generally				

B18. **Do you currently do any other paid work apart from your main employment?**

- *Yes*
- *No*

B19. **In which type of the following organisations are you working?**

- *Higher Education Institution*
- *Research Institute*
- *Public service*

- *State enterprise*
- *Private enterprise*
- *Private non for profit foundation*
- *Multinational enterprise*
- *Other, please specify*

B20. **Why do you undertake this activity?**

- *Financial reasons*
- *Job satisfaction*
- *Relevance with your research*
- *Other*

Section C: Past Employment - work history: What have you been doing since finishing your PhD?

We are interested to know some of the activities you have undertaken since finishing your doctorate. Initially we are interested in the first activity undertaken since completing your PhD. By activity we mean different jobs or periods where you were engaged in full time/part time work, in training, were looking for work or were taking time out.Please start from the very first activity you undertook after completing your PhD.

C1. **Thinking about the activity you are doing now, have you been doing this activity continuously since completing your course?**

- *Yes , I have been engaged in the same activity continuously since completing my PhD and have done nothing else since*

No, I have changed activity at least once since completing my PhD course

First Activity since completing your PhD

Duration	Nature of main activity	Job title/Tasks *(e.g. design engineer in a private enterprise, supervising a team of 10 technicians)*	Reasons for change	Relevance with PhD
Date started (MM/YYYY)	*Employed FT*	**Job title**	*It fitted into my career plans*	*Yes*
Date finished (MM/YYYY)	*Employed PT*	**Main tasks**	*It was exactly the type of work I wanted*	*No*
	Self employed		*It was the best job offer I received*	
	Voluntary/Unpaid		*It was an opportunity to progress in the organisation*	
	Unemployed		*To gain experience in order to get the type of job I really want*	
	Other		*To see if I would like the type of*	

work it involved

To broaden my experience/to develop general skills

It was within my family run business

In order to earn a living

The salary level was attractive

I wanted to work in this region

Other, please specify

Other

C9. **Did you undertake any EMPLOYMENT activity between this activity and your current activity?**

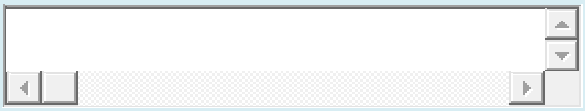
Yes

No

We are interested in the most recent EMPLOYMENT activity that you have undertaken before your current activity. If you worked for the same employer over the whole period, but were promoted or had different job roles then this would count as more than one activity.

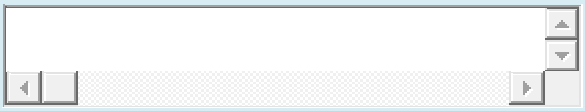
Duration	Nature of main activity	Job title/Tasks (*(e.g. design engineer in a private enterprise, supervising a team of 10 technicians)*)	Reasons for change	Relevance with PhD
Date started (MM/YYYY)  **Date finished (MM/YYYY)** 	○ *Employed FT* ○ *Employed PT* ○ *Self employed* ○ *Voluntary/Unpaid* ○ *Unemployed* ○ *Other*	**Job title**  **Main tasks** 	○ *Fixed term job/course ended* ○ *Change/improve my career options* ○ *Promotion* ○ *Obtained employment* ○ *Broaden my experience* ○ *Given notice/made redundant* ○ *Personal/family reasons* ○ *Wanted to relocate* ○ *Other*	○ *Yes* ○ *No*

C17. In total, how many activities have you undertaken overall after your PhD award including your current activity?



C18. If you have experienced any periods of unemployment between finishing your PhD and your

current activity, how many weeks approximately have you been unemployed?



Section D: Satisfaction

This section will provide information on your satisfaction about your career path, your choice of subject/institution/degree but also whether you think that your overall investment in doctoral education has been justified by the career path.

D1. **Given what you have said so far, how satisfied or dissatisfied are you with your career to date?**

- *Very satisfied*
- *Fairly satisfied*
- *Neither satisfied nor unsatisfied*
- *Not very satisfied*
- *Not at all satisfied*

D2. **How far do you agree/disagree with the following statements ?**

	Completely agree	***Agree***	***Neither agree nor disagree***	***Disagree***	***Completely disagree***
a. My PhD education was good value for money					
b. Greek employers prefer Greek doctoral graduates who undertook their doctoral education in Greece than doctoral graduates who acquired their doctorate abroad in my subject area					

c. Obtaining a doctorate has met my expectations in relation to contributing to my career to a great extent					
d. The Greek state needs to enhance the employment opportunities for doctoral graduates in my subject area					
e. Employers should have better information about the skills and content of the doctorate in my subject area					
f. If I had a second chance to decide whether or not to undertake a doctorate, I would have chosen to do it					

SECTION E: Personal Characteristics

E1. **Gender**

- *Male*
- *Female*

E2. **Date of birth (DD/MM/YYYY)**

E3. **Living arrangements**

- *Living with my partner*
- *Living with my partner and our children*
- *Living alone*

Living alone with my children

Living with friends / cohabiting

Living with parents/relatives

Other, please specify

E4. Academic background before your PhD (previous degrees)

a. Title of first degree qualification (e.g. BSc in Chemistry)

b. Institution awarding first degree qualification (e.g. Athens Kapodistrian University)

c. Title of second degree qualification (e.g. MSc in Organic Chemistry)

d. Institution awarding second degree qualification (e.g. Manchester University)

Other

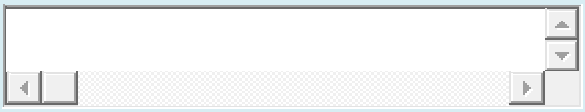
What is your parents' occupation and if relevant your partner's occupation?

Father's occupation

Mother's occupation

Partner's occupation (if relevant)

If you are interested in the research findings, please write below the e- mail account where you would like the report to be sent



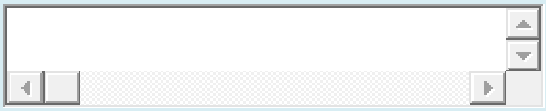
If necessary, would you be willing to answer a few supplementary questions?

Yes

No

Please indicate below the telephone number where you can be easily conducted

If you are in contact with other doctoral graduates in Sciences and Engineering which have graduated about the same time as you, please either forward the e- mail sent to you or write below the e- mail addresses of these people



Thank you for your contribution. Please press the Submit button below.

Appendix II: Interview guide for PhD graduates (English version)

The career paths of Greek Science and Engineering PhD graduates
Telephone Interview Schedule

Interview Number:
Date and time of Interview:
Interviewee Name:_____ m/f
Age:

Before the interview
Request to the interviewees for sending a CV before the date of the interview.

Introduction
Hello, I am Charoula Tzanakou from the University of Warwick. I arranged to call to follow up some of the issues covered in the online survey and enrich the information gathered from the questionnaire. Thank you for agreeing to take part. The interview will take approximately half an hour. The aim of this discussion is to acquire an overall picture of your experience as a PhD student, your career development since submitting your PhD.
I hope that this is still a suitable time to talk to you? Before we start, I'd like to stress that the information you provide will be treated in confidence. Nothing you say will be passed to a third party or cited in a way that enables you to be identified.
Is it OK if I record the interview? This makes it easier to have a conversation and to make sure that I don't miss anything. The recording will be used only to make writing up easier and will not be accessible to third parties or used for any other purpose

PRIOR TO PHD
Before touching upon the PhD experience and your career path since then I would like to ask about what you did before your PhD and why you decided to proceed to PhD study:

1. You mentioned in the survey that you have a BA in…… and a MA (if applicable) in …..
   Did you move straight on to a PhD after completing your UG/MA degree or did you spend time in employment? If yes, what employment experience did you have before the PhD including any unpaid or voluntary experience?

DOCTORAL EDUCATION: MOTIVATION, FUNDING, HEI CHOICE

2. You indicated in the survey that you decided to do a PhD because [A11] **….**
   [If more than one] - What was the most important reason?

(If the following information has not been provided then PROBE for):

- When did you first consider doing a PhD? What/who influenced you towards this decision?
- How did your family react in this decision?

- Did you have a clear idea about what you wanted to do next, in career terms, after you had completed your PhD? Did the PhD influence the way you saw your career?
  Did the above reason change during your PhD or after the PhD? (?)
  Did your ideas about your career change in the course of your PhD studies?

3. You mentioned that you chose to do a PhD in (HEI name: A4/A5) because …[reason for HEI choice –A12]
   And you said the most important reason was [A13]…Could you tell me a bit more about this?

4. In the questionnaire, you said that your funding for the PhD was. [A10]
   If mixed funding:…….. For how long and what did it cover? (Research costs such as travelling, participating to conferences, training costs)

   If research/teaching assistance or employment related/not related to PhD: What was the main reason for this? Any other reasons?

5. Did you know what you would you like to do next before starting the PhD?
   Which alternatives did you consider?

DURING THE PHD

First, can I just check…You started your PhD programme **in** [Year :A9…] **at** [A4/A5…..] **in** [SCIENTIFIC FIELD:…A6] **–** Is this correct?

6. What was the topic of your thesis?

7. What kind of work did the research involve**?**
   e.g. Analysis of existing data - Did you use particular data analysis software or other research instruments or techniques to collect or process data?]
   Experimental work (e.g. 'laboratory)
   Computer based
   Large-scale statistical datasets
   Model building - Modelling
   Simulation
   Forecasting
   Case studies [WHICH, WHY, HOW MANY..?] – Cooperation with industry or other HEI?
   Other

8. You mentioned that your topic require: to a great/some extent [A14]
   Could you say a bit more? What did this include?

9. As part of your PhD, did you spend any time away from the university where you studied for your research? (overseas, any other university)Where? How long did it last? How was it decided?

SKILLS AND TRAINING

10. What were the main skills you developed during your PhD?
    What kind of subject specific skills did you develop?

11. Were you required to take research methods classes in the institution where you studied as part of your PhD programme? IF YES**:**
    - Was research methodology mainly training in skills and techniques or did it also include critical evaluation of research more broadly?
    - Did it include writing and presentation of research findings?
    - Was there any formal assessment of learning of this training?

12. Did you undertake any external research methods training as a PhD student? What did these involve?

13. Are there any areas of research in which you feel, with hindsight, that you would have benefited from more training?

SOFT SKILLS

14. What kind of soft skills did you develop?
    In terms of soft skills, did you develop: Project management? By taught formally/guidance or developed during the PhD? Time management?
    How did you develop them? Explicitly taught/ Guidance in developing/ Developed yourself as part of PhD training

15. Were you given any formal training or help in developing in COMMUNICATION SKILLS, FOR EXAMPLE: different styles of writing for different audiences? Oral presentation of research findings? Networking? Other?
16. Were you given any opportunity to develop career management skills, though your department or the university careers advisory service [e.g. CV writing, job interview techniques, career planning

BEFORE THE END OF THE PHD

17. **Did you start applying for jobs:**
    - before you had completed your PhD?
    - after submitting it, before the oral examination?
    - after you knew it had been awarded?

    Talking about submission, you mentioned that you completed your PhD in ....(month:A1) of....(year:A2). Is this when you submitted your thesis or awarded your PhD (after possible corrections)?

CAREER HISTORY

I'd now like to move on to talk to you about your career history until now. In the questionnaire there were two options:

A. HAVE BEEN ENGAGED IN THE SAME ACTIVITY UNTIL NOW – if the respondent answered this one then:

- Have you considered any other options in the last 6 months? If yes, what were they? Can you tell me a bit more about that? (probe if they actually applied or thought of applying)

B. HAVE CHANGED ACTIVITY SINCE PHD – in this case

- You mentioned you have been employed as a…… and a…….. .
  Can you talk me through your career history from the time you submitted your thesis until the present time to understand a bit better your career path until now?(probe for [[periods of unemployment if there were and when.)
  So, you submitted your thesis in [A2] . What did you do after that?

  First Activity / Job title /Employment contract/How did you find it/Relevance with PhD/ Reason for change/influences/incidents for taking up this activity?
  Were you considering any other job options before taking or during this activity?
  Was the PhD required?

  Next activity [as before] etc

ACADEMIC AND NON ACADEMIC SECTOR: INTERSECTORAL MOBILITY AND PERCEPTIONS OF DIFFERENT SECTORS (often asked the ones who had experience in both sectors)

18. How do you compare academic and non academic jobs? What are the pros and cons in each sector for PhD grads in your research area?

19. What kind of employment opportunities are available for you and your fellow PhD grads from the same research area? When you completed the PhD how was the labour market for PhD grads in your field? Do you think it has changed since then?)
    [if not clear] How did you get your [non-academic] job?

CURRENT SITUATION [ALL IN EMPLOYMENT ONLY]
I'd now like to ask you a few more detailed questions about your current/last job. You said just now you are working as a……[job title :B7]. And you are [B1 –employment situation]

20. This post is [contractual arrangements:B9]: How do you feel about that? [if permanent] how important is for you to have a permanent job?

21. You are working in [Type of organisation: B5]Why did you choose to work in this sector?

22. You indicated that you found this job though.. [B13]. If more than one, could you tell me about how you became aware of this job and how the application process was ?[where did you learn about it, where did you see it, where did you search, how did you apply etc which might make the respondent tick different options)(probe for personal/professional networks, extent of meritocracy, links with business)

23. Do you know how many other applicants you were competing against for this job?
    If yes, do you know how many other candidates were short-listed? [Did the other candidates have PhDs?

24. Was the PhD was mentioned as essential or desirable in the job details
    Why do you think *you* were recruited?
    [If not apparent so far: Do you think having a PhD was an advantage?]

    For non academic employment
    Do other people that do the same job as you in the organisation have a PhD?

25. You mentioned that you decided to take the job because....[B14].
    If more than one, what was the main reason?
    Were you considering any other job options at the time? If yes, what were they**?**

DAY AT WORK -CHARACTERISTICS

26. In order to understand what different PhD jobs entail I would like you to tell me what you did yesterday? What time did you start your work? [probe for role in meetings etc]
    Would you say it was a typical day?
    What do you *like* about your job?.....and is there anything you *don't* like about it?

27. You mentioned in the survey that you most of the time/some of the time/etc..B16)
    Provide an example on the extent to which disciplinary/PhD knowledge is used and subject specific skills are used and ask for example if job title and tasks do not correspond to the answers)

28. You mentioned that you salary is……[B11].. Gross or net?
    Do you think that is reasonably well paid for what you do? What other benefits do you enjoy apart from your salary?

29. You mentioned that you were very/not at all satisfied with the following aspects of the current employment [B15]

CONTRIBUTION TO THE WORKPLACE

30. You mentioned that the PhD has enabled you to: [B17]
    Could you give me an example of this? [select some of them according to the responses of interviewee]

SECOND ACTIVITY

You indicated in the survey that you have a second activity in [type of organisation:B19] and the reason for this activity was […B20.]
Could you tell me a bit more about this?

How do you feel about this activity in comparison with your current activity?

SATISFACTION/ CAREER DEVELOPMENT

31. You mentioned that you have been [degree of satisfaction:D1] with your career up to date. Could you say a bit more? In what aspects?

32. Have you experienced any obstacles or barriers in your career development since submitting your PhD? What issues might have limited your career options?
    Have you been applying for [other] jobs recently? [IF YES, PROBE FOR DETAILS]

FUTURE CAREER

33. How do you see your career progressing from here?
    [PROBE for whether progression will carry on within the same organisation/sector]
    What do you expect to be doing in 5 years' time?
    What would be your 'ideal' work life pattern?

OPINIONS/STATEMENTS

34. There were some opinion statements and I would be interested in getting to know a bit more about your opinion on some of these [D2]. You disagreed/agreed with the statement...a-f.

GENERAL VALUE OF PHD

- Are there any other aspects of your life when you feel that your PhD experience has made an impact for you?
- What is the thing you value most about the fact that you have been able to study for a PhD?

END OF INTERVIEW

That's it. Thank you very much for letting me ask you these questions. Do you have any other points you'd like to make about your PhD or your career so far…?

If I have any further, follow-up questions when I transcribe the interviews, is it OK if I call you again? When the project is completed, I will make a summary of our findings available to participants who would like them and will email all those who were interviewed. The email address I have for you is [INSERT:]. Is that the best one to use, say, if I make contact in six months or so?

Thank you again for taking part in this interview.

IMPRESSION/COMMENTS FROM THE INTERVIEWEE

Appendix III: Interview guide for employers of PhD graduates (English version)

Introductory (some of them could be retrieved from the website)

- Organization (status, size) – main activity
- What is your job title? Your tasks? (– This question and the following are good for building rapport with the interviewee. Easy factual questions are asked in the very beginning in order to be in more depth as the interview goes on.)
- How long have you been doing this job?
- How long have you been for this organization?
- Have you been in this post since you have started in this organization?

Statistical information on:

- How many people are employed currently in your organisation?
- If no answer, would you say it was:
    - 11-24
    - 25-49
    - 50-99
    - 100-249
    - 250-499
    - 499-999
    - 1000 or more
- Thinking back over the last five years, has employment in your organisation increased/stayed the same or decreased? To what degree (5, 10%) and why?

In reference to PhDs:

- How many PhDs did you employ this year?
- Are they more/less than last year?
- How many have you employed in the last 5 years

General Recruitment

- What is the current recruitment policy of your organization?
- What kind of degrees you are looking for?
- Are there any particular subjects/disciplines you are looking for? (are there any subjects that you wish you received more applications from?) Have you experienced any difficulty in recruitment with specific discipline/subjects graduates?
- What kind of skills are you looking for in the people you recruit?
- Recruitment of graduates/postgraduates/type of qualification sought

PhD recruitment

- What is your recruitment strategy in reference with PhD recruitment?
- Do you advertise positions which require PhD degrees? What percentage of the overall jobs have a doctorate qualification as a prerequisite?
- In what subject area?
- What is your experience of recruiting PhD graduates?
    - Was it more difficult than recruiting a graduate? Why? In which terms?
- Do you specifically look (target) for PhDs? If so, how?
- What is the main reason for looking for PhD graduates?
- What are the benefits of recruiting PhD graduates?
- What are the costs of recruiting PhD graduates?
- Do you have any concerns about recruiting PhD graduates?
- Does your organization have suitable roles for researchers? What types of jobs are PhDs mostly employed?
- In general can people develop scientific careers in this organization?

Perceived added value of a PhD

- How far do such recruits contribute to innovation?
- How far do such recruits make a difference in the workplace?
- Have you had any 'best practice story' or ‘catastrophe’ experiences of recruiting doctoral graduates in the past?

General perceptions about recruiting researchers

- What do you think about PhDs working in an environment like your company’s?
- In general how satisfied have you been with doctoral graduates that you have recruited? Why?
- From your point of view, are the PhD graduates you recruit as good as in the past?

Understanding / knowledge of access to researchers as potential employees/Recruitment of universities

- Where do you look for PhD graduates?
- Have you recruited people directly from University? How many? Were these people recruited from postdoc, docs
- Do you sponsor any existing staff to study towards a doctoral qualification?
- Other than staff do you sponsor students for studying a first degree/PG degree/doctoral degree?
- Do you provide any postdocs or fellowships in your organisation? How many are there currently? Who funds the postdocs?(RC)
- In what type of vacancies are PhDs more interested?

- How satisfied you are with recruitment of postdocs?

Differences between educational levels and research levels

- Do you identify any differences between MSc, MBA and PhD?
- Would you feel differently about recruiting a junior researcher from a more experienced researcher?
    - Why?
- Do you value professional experience over a PhD qualification?

More generally

- Do you find it difficult to fill specific vacancies? Skills/knowledge missing. In what occupations / subjects do you anticipate increasing recruitment? Would it be the same for PhDs? Any concerns that it might be difficult to find graduates from these areas?
- Thinking about the future, in what occupations do you anticipate recruitment problems in the next ten years? Why?
- In general do you encounter difficulties in recruitment for specific vacancies/subjects? What are the future challenges in recruitment for your company?
- Are you aware or have you been involved in any policy initiatives to inform and facilitate the labour market regarding recruitment of highly skilled workforce such as the PhD graduates?

Comparison between PhD graduates educated in Greek and UK Universities (for Greek employers)

- Do you employ Greek PhD graduates educated in foreign Universities? Is there a preference towards specific universities or specific country?
- What about UK Universities' graduates? UK Universities are the most popular for Greek doctoral graduates according to statistical data. What do you think about the UK doctoral degrees? How UK and US doctoral degrees compare in the disciplines you are looking at?
- Do you employ doctoral graduates from UK Universities? How do PhD graduates from Greek universities are compared with PhD graduates from UK Universities? Are there specific subjects that UK Universities are preferable than Greek ones?

Appendix IV: Online survey design and challenges, survey population and technical specification.

Choosing the format and practicalities of the survey: Survey preferences for Greek PhD candidates

Through a small online survey was conducted among Greek PhD candidates in Greek and UK Universities in the context of a PhD symposium in LSE, suggestions and advice were asked for identification of Greek PhD graduates especially in UK universities. In addition, a paper questionnaire during the symposium was provided to participants of the PhD symposium. The questionnaire included only five questions addressing the preferences of Greek PhD candidates in terms of surveys.

According to the receipt of 31 questionnaires, 90% of the respondents preferred answering an online questionnaire (versus postal/telephone) and 68% thought that a couple of reminders would help them remember to fill in the questionnaire

The results were not as clear when respondents expressed preferences about a pre-notification mail prior to the questionnaire. This pre-notification mail would explain the aim of research and the importance of their contribution. While 55% (17 people) thought that it would be a good idea, 39% considered as better option to get everything in one go (a mail with the aim of research and the actual questionnaire). Reflecting on this result and taking into consideration the fact that there will be potentially three emails sent (the actual email invite and 2 reminders if they don't answer) there was a risk that respondents might get irritated by the bombarding of emails. At the same time, email contact information was not always possible (letters were sent to some of the participants) while in the case of PhD graduates from UK Universities, alumni groups or offices had the responsibility of sending invites on my behalf thus, an approach with sending many emails including a pre notification one was not possible.

In addition, it was asked whether an incentive would make them more willing to fill in a questionnaire. While 58%(18) of the respondents reported that they wouldn't be more willing while 42% (13) thought that an incentive might 'enhance their willingness'. Participants were also able to suggest incentives that would encourage participation in the study. Almost half of the respondents (15 people, 48%) were interested in an incentive that would be related to their research interests such as a subscription to a research journal. Access to research

findings also seemed to be quite a good incentive. Financial incentive was thought as a good idea for one respondent.

Retrieving information

As mentioned in chapter four, many PhD graduates were identified through web browser since their information was either missing or outdated. This was a time consuming and painstaking. Email identification varied across the different persons and could last between 2 to 30 minutes. If the person in question had been very mobile or had published a lot of papers, it was important to track the most recent institutional affiliation and the respective email address. A number of different internet resources were employed in this effort such as Google, Google Scholar, Linkedin, GRnet, TEE.gr, Facebook). This process was repeated after the launch of the survey since approximately 150 email addresses bounced back. Since it was possible to identify which addresses were not valid, the web search process started again to retrieve a more recent email account of these PhD graduates.

The retrieval stage included the following sources and process in order to identify valid email accounts:

- **Google: searching the name in Greek, searching the name in English**
- **Google Scholar: identify recent articles, find affiliation and then check the institution for the email address**
- **GRNET: it is a Greek research and technology network. This network was an initiative from GSRT which has a database of names working in research institutes and universities (access to email and phone information): http://ds.grnet.gr/**
- **TEE.gr: this is the website for the Greek professional association of engineers. The majority of PhD graduates in engineering have undertaken a first degree in engineering (UG) as well. TEE holds a database online where information of engineers can be retrieved such as address and telephone.**
- **Linked in: new media used as professional network. Through this network, it was possible to identify organisation affiliation both in the academic and business sector industry. However, when the email address was difficult to be retrieved, the researcher sent a request to participate in the survey.**

Questionnaire design – Previous studies

This questionnaire has adopted many questions from the Destinations of Leavers from Higher Education (DLHE) conducted by the Higher Education Statistics Agency (HESA) in 2008-09. Where appropriate, questions were modified, often including additional options to reflect Greek contextual information.

The career path history section was also informed by studies on career paths: the early career paths of 1999 Graduates and Diplomats Class of 1999 and the EACEA survey which looks at how people's careers are changing across Europe. Both surveys had a section on career history information which had a similar structure but it addressed more issues than the section in this research. The former survey was a paper one so the career history information worked quite well but when it is translated into web surveys, the structure of this section does not work as efficiently as in paper. As it was mentioned in the technical report of the EACEA survey - which was an online survey – respondents found it difficult to fill in this section. Thus, this section in the current research has been reduced to become more comprehensive and simple to the respondents while amendments have been undertaken to the questions included with a view to reflect and fulfill the objectives of this research. Since the respondents were doctoral graduates for at least three years, it became evident that there may have undertaken a big number of activities which could not be captured in this section. For this reason, this section asks for the first and the most recent activity before current employment.

SNAP tool: launching and managing the webhost survey

As mentioned in chapter four, there were some problems with launching the online survey in Greek although SNAP ensured that the tool would not create any problem.

The main problem encountered was that the email invite – which was part of the SNAP software and enabled the tracking of participants' responses – could not be sent in Greek to the participants of the study. Although SNAP helpdesk suggested that the problem might be related to the computer network of the University which did not allow emails to be sent in Greek (in plain text format rather than HTML). Therefore, an ongoing communication with the IT helpdesk of the university but also the IT helpdesk of a specific department (WBS) was carried out to solve this problem. Initially, the helpdesk of the university changed the settings of the

computer to maximize the potential use of Greek characters. However, the problem remained unsolved and soon SNAP helpdesk realized that the problem was related to a characteristic of the tool itself which could not support Greek characters.

Therefore, SNAP helpdesk proposed two options to maintain the ability to track the ID respondents:

1) to use a mail merge invitation which was not available in the university system. In this university, the outlook is not linked to word so merging functions were not available.

2) to use SNAP webhost services which were extra services provided at an additional cost.

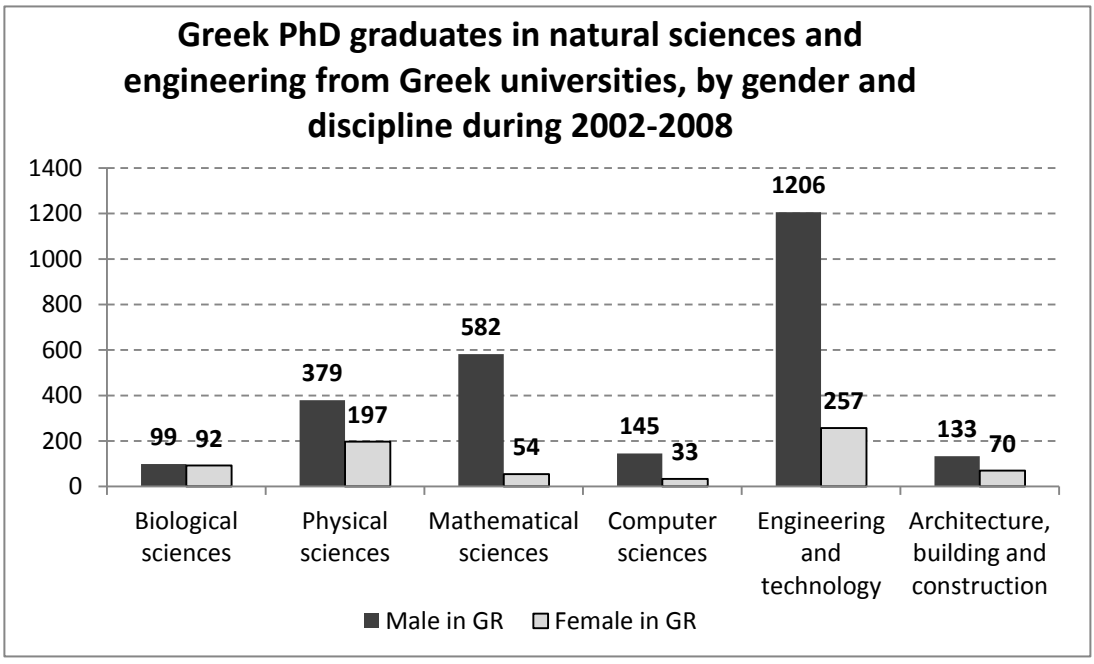
Since the problem lied within SNAP software, it was negotiated with the sales department representatives regarding the the free provision of webhost services. This was soon achieved. However, this meant that additional time was required to familiarise with the webhost service. Combining the guide information with on-going discussion with the SNAP helpdesk the survey was launched as soon as possible.

In addition, after the launch of the survey, a couple of problems also emerged. Firstly, the survey link in the reminder email did not work according to some respondents who sent me an email to inform me. However, the reminder was sent on Saturday when the SNAP helpdesk was not open and it was not fixed until the beginning of the following week. Another reminder was scheduled to be sent during Christmas on the 26th of December including Christmas wishes and a final invite to participate in the survey. For reasons unknown to the researcher and SNAP helpdesk, the reminder was not sent on that date but a couple of days later. These technical problems might have influenced the response rate.

The Greek Population of PhD graduates from Greek and UK universities

Greek Universities - Hellenic Statistical Authority (ELSTAT)

Greek PhD graduates during 2002-2008 from Greek Universities	Gender		
Disciplinary area	**Female in GR**	**Male in GR**	**Total**
Biological sciences	92	99	191
Physical sciences	197	379	576
Mathematical sciences	54	582	636
Computer sciences	33	145	178
Engineering and technology	257	1206	1463
Architecture, building and construction	70	133	203
Total	703 (22%)	2544 (78%)	3247



The GSRT study on Greek doctorate holders (2008)

In 2008, a nationwide survey was undertaken by the General Secretariat for Research and Technology in Greece which concerned Greek PhD graduates during the period 1995-2005. This survey is the only study with a focus on Greek PhD graduates. The Greek project's initial aim was to develop a comprehensive database of PhD graduates in Greece within the context of the CDH initiative which would be used subsequently for undertaking research on the profiles and the career paths of the PhD graduates in Greece. However, the GSRT survey aimed at building a comprehensive database of PhD graduates in Greece and undertaking research on the profiles and the career paths of the PhD graduates in Greece. Despite its shortcomings,[221] it is the only available source of information regarding Greek PhD graduates. Access was provided to the researcher of 2784 responses of the survey out which were filtered by year of PhD award (2002-2008) and discipline of PhD study (natural sciences and engineering) taking the sample down to 887 cases.

Characteristics of the filtered GSRT sample

A sample of 887 respondents was identified with a doctorate in natural sciences and engineering. While this study includes mainly PhD graduates from Greek universities, there were also foreign-educated doctorate holders that participated in this survey. Therefore, out of 887 respondents, 699 respondents had been awarded a doctorate from Greek institution and 188 from a foreign one.

This sample was composed by 67.1% of male and 32.9% female respondents. The age of respondents range from 25 to 57 years old with the majority of respondents falling within the 31-35 age group (55.7%) and 36-40 years old (22.4%).

[221] The register derived from this survey included 10.629 PhD graduates out of which only 3994 PhD graduates replied the survey questions. According to approximations of the study authors, the survey concerns about 73% of targeted population within the time period designed (1995-2005). It is mentioned that it is not a representative sample of the population but it is an importance source of information on this specific population.

In terms of doctoral education characteristics, almost half of the respondents did a PhD within positive sciences (47.9%) while 25.7% of respondents completed a doctorate in engineering and technology subjects and 26.4% had selected an interdisciplinary doctorate within the positive science and engineering. Slightly over half of the sample had funding for their PhD (53.9%). In terms of HEIs, almost 65% of the sample was concentrated in four Greek institutions: National Technical university of Athens (19.4%), the Aristotle University of Thessaloniki (15.4%), the National Kapodistrian university of Athens (14.85) and the university of Patras(14.7%). There is an equal representation of respondents that have completed a PhD across the years 2002-2007 with a very small sample in 2008 (4 responses).

The employment characteristics of the sample were the following: almost half of the respondents were working in a higher education institution (47.8%), followed by self-employment (23.1%) and public service (19.5%). State enterprises and private sector concentrated only a few responses. A very small proportion of the sample (3.2%) appears to be working in the private sector. Taking into consideration the evidence by CORDIS in 2005 there were about 1202 PhD graduates working in the private sector. Therefore, this finding might be misleading caused by the sampling methods of the survey. The survey aimed to capture as many PhD graduates as possible to meet the need for a register of PhD graduates since 1995. While the National Documentation Centre holds a register of PhD graduates (information is available regarding institution, discipline, year of award), the contact information was not readily available. The company that undertook the survey, decided not to use the database from the NDC (as the author of this study did) but instead it used advertisements to invite PhD graduates to participate in this study. Looking at the sources where the survey was advertised, it becomes evident that there was a high concentration on HEIs and public sector (since the majority of PhDs work in the higher education and wide public sector) which might not have reached respondents with PhD credentials working in the private sector.

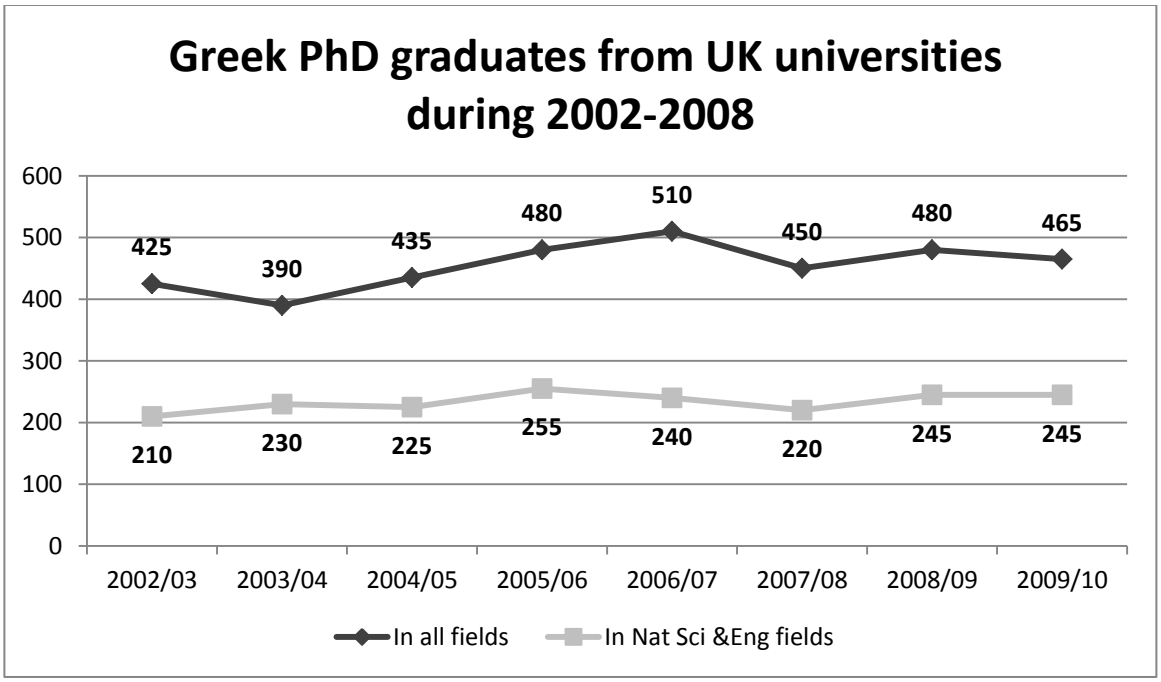
Research institutes are not classified separately in the GSRT survey but PhD graduates working at such institutes are likely to have been included within the public sector rather than tertiary education institution.[222] (GSRT, 2008, p.133).

[222] The majority of research institutes in Greece are under the aegis of the General Secretariat for Research and Technology which belongs to the Greek Ministry of Education. – add more check for

UK Universities – Higher Education Statistics Agency (HESA)

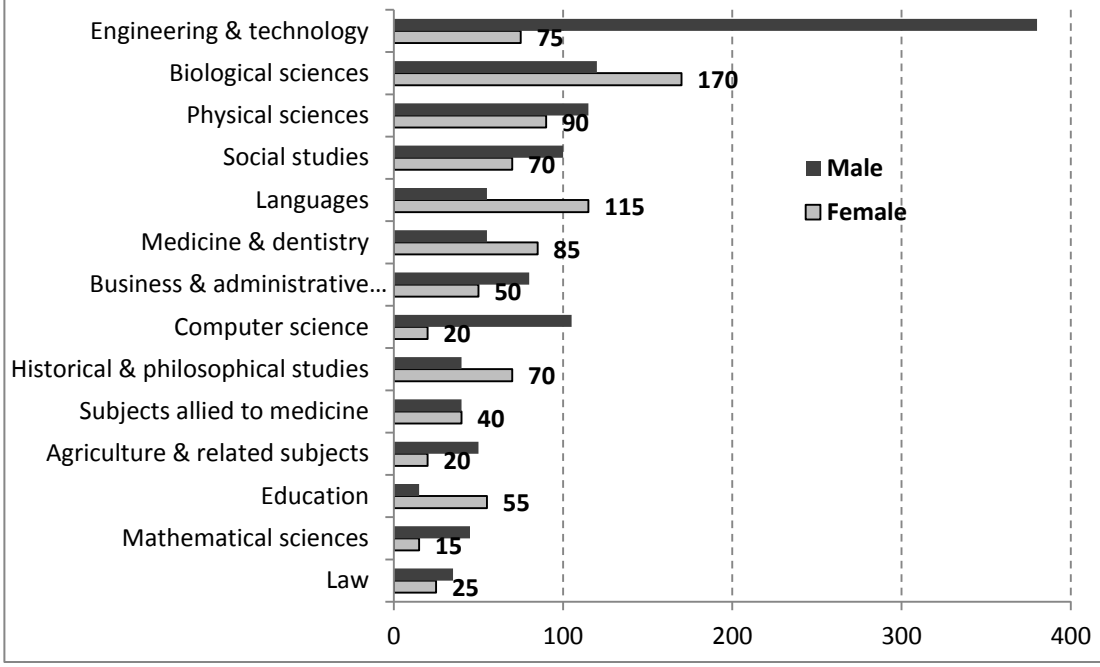
According to the data from the Higher Education Statistics Agency (HESA), most Greek PhD graduates from UK universities have pursued doctoral studies in subjects in the following studies: engineering and technology subjects, biological sciences, physical sciences, social studies and languages

1385 Greek students obtained their doctorate in S&E fields (similar fields as above) in UK Universities using the same cohorts (2002-03, 2003-04, 2004-05,2005-2006, 2006-2007 and 2007-2008). The number of Greek PhD graduates in natural sciences and engineering has remained similar in the past decade with an output of 500 PhD graduates per year in these disciplines.

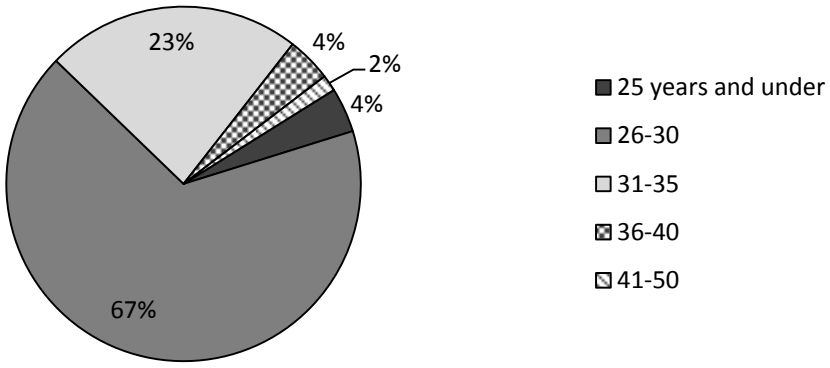


Breaking down by disciplines in natural sciences and engineering, Greek PhD graduates from UK universities concentrate in engineering and technology (39%), Biological sciences (25%) and physical sciences (18%). In gender terms, the population is comprised of 67% men and 33% women. In respect to gender and disciplines, women exceed men PhD graduate in biological sciences in the UK universities while men dominate in almost all the other disciplines in natural sciences and engineering.

Greek PhD graduates in UK universities during 2002-2008, by discipline and gender



PhD graduates from natural sciences and engineering during 2002-2008 from UK universities by age group



Last but not least, the majority of foreign-educated Greek PhD graduates completed their doctorate when they were 26-30 years old.

Comparing the population of Greek PhD graduates comparatively who completed their PhD in UK and Greek Universities in 2002-2007/08

UK Universities				Greek Universities			
	Gender				**Gender**		
Disciplinary area	**Female**	**Male**	**Total**	**Disciplinary area**	**Female**	**Male**	**Total**
Biological sciences	200	140	340	**Biological sciences**	92	99	191
Physical sciences	105	135	245	**Physical sciences**	197	379	576
Mathematical sciences	20	55	70	**Mathematical sciences**	54	582	636
Computer science	20	135	160	**Computer sciences**	33	145	178
Engineering & technology	90	450	540	**Engineering and technology**	257	1206	1463
Architecture, building & planning	20	10	30	**Architecture, building and construction**	70	133	203
Total	**455**	**925**	**1385**	**Total**	**703**	**2544**	**3247**

Sources: Higher Education Statistics Agency[223] (HESA), Hellenic Statistical Authority (EL.STAT.), formerly NSSG

Unsurprisingly, there was a dominant representation of male PhD graduates in the disciplinary areas examined. Men constitute 66,8% and 79.8% of the Greek PhD

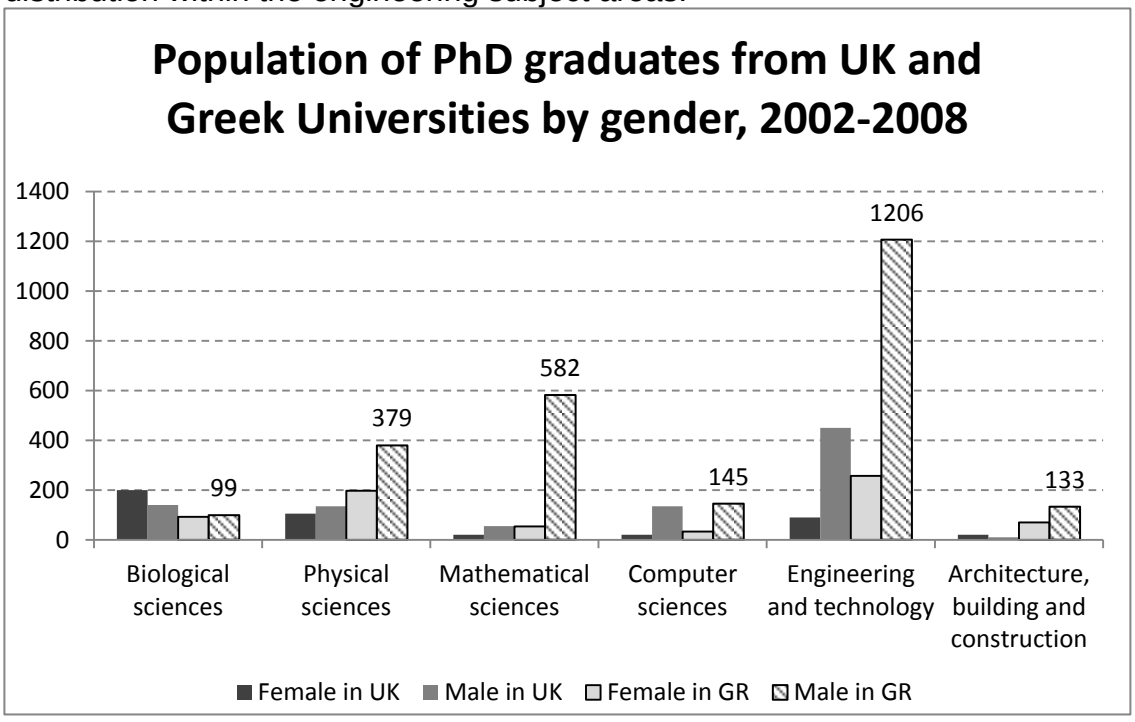
[223] The numbers have been modified according to the rounding policy of HESA

graduate population from UK and Greek Universities respectively. Comparing Greek and UK universities, there were two interesting issues emerging:

- **There was greater share of women that completed their doctoral studies in the UK Universities rather than Greek universities during this specific time period (33.8% in UK and 20.2% in Greece).**
- **Biological sciences stood out not only as the second most commonly-studied disciplinary area for the UK-educated Greek PhD graduates where women outnumbered men, but also as a discipline where many more PhDs (almost double numbers, 290 vs 158) were awarded to Greek students by UK rather than from Greek Universities.**

In addition, women PhD graduates were outnumbered in all relevant disciplines (natural sciences and engineering) by men in the Greek universities. This pattern is followed in UK universities with the exception of biological sciences.

However, there is a quite diverse picture about the 'popularity' of the other PhD disciplinary areas which were followed by Greek PhD graduates in Greek and UK universities. In all other disciplines, there were more Greek-educated PhD graduates than UK-educated with the exception of Computer Sciences. Unfortunately the data from HESA do not allow for more specific disciplinary distribution within the engineering subject areas.



Technical specification of the survey

Eligibility

The online survey addressed Greek PhD graduates that completed a doctorate in natural sciences and engineering during 2002-2008. These criteria were communicated in the email invite and the introduction of the survey to prevent non eligible respondents from answering. However, 12 cases were invalid out of the total 253 responses leading to a database of 241 eligible cases. Three responses were added from the pilot survey reaching the total of 244 responses. Therefore, the dataset used for this study is comprised of 244 responses, out of which 50 respondents had completed their doctorate in UK and 194 in Greek universities.

The participation of PhD graduates according to year of award is decreasing the longer they have taken the PhD, which can be explained to some extent by the fact that their contact information would be older. Most of the respondents completed their doctorate during the 2003-2006 period. However, cases falling within 2002 and 2007-2008 were retained in the sample because it increased the number of the sample especially in terms of the foreign-educated PhD graduates.

Cohorts of PhD graduates -respondents

		Male	Female	Total	%
Year of PhD award	2002	6	3	9	3,7%
	2003	33	10	43	17,6%
	2004	55	10	65	26,6%
	2005	41	12	53	21,7%
	2006	39	16	55	22,5%
	2007	9	3	12	4,9%
	2008	4	3	7	2,9%
Total number		**187**	**57**	**244**	**100%**

Date of birth

Through the date of birth information, it was possible to estimate the current age of the respondents and their age at the time of the PhD. The latter took into account the data regarding the year of the PhD award. Both variables were classified into age groups (under 25, 26-30, 31-35, 36-40, and 41-50, over 50) that are used by HESA in order to be able to compare the sample with the population.

Current age

The range of respondents' ages starts from 29 to 74 with a mean of 37.28 and a standard deviation of 6.05. The average age of study participants is 36 years old according to the median statistic.[224] Classifying date of birth into age groups provides a more comprehensive picture of the age profile of the respondents according to which nearly 80% of respondents fall within two groups: 31-35 years old and 36-40 years old. It should be noted that this is the age of the respondents at the time of the survey and not at the time when the doctorate was awarded which is provided below in the doctoral education section.

Age at the time of PhD completion

The median and mode show that most participants in this study had an average age of 31 years old at the time of the PhD award. More specifically, according to central measurement indicators: the mean age is 31.96, the median is 30.50 and the mode is 31. The range of respondents' ages starts from 25 to 68 with a mean of 31.96 and a standard deviation of 5.77.These results are based on 232 valid responses with 12 missing.

Educational Background - Prior to PhD

Taking into account the information on the first degree, a new variable was created (disciplinary area of first degree) dividing the disciplines into two main groups: natural sciences and engineering. This was then used to explore whether there was disciplinary mobility between disciplines in the first and doctoral degree.

[224] According to central measurement indicators: the mean age is 37.28, the median is 36 and the mode is 34. These results are based on 232 valid responses with 12 missing.

The institution awarding prior to PhD degrees also indicated the degree of mobility for Greek students and their tendency to change universities/departments.

Parental and partner's socioeconomic status

The study participants were asked to fill in the occupation of their father, mother and partner. The job titles were translated and coded through CASCOT using the Standard Occupation Classification (SOC) 2000. About 500 job titles were coded and then transformed according to the National Statistics Socio-Economic Classification (NS-SEC). The data were classified accordingly to the following categories: higher and lower managerial and professional occupations, intermediate occupations and small employers and own account workers. Three categories were additionally developed by the researcher –taking into account the contextual data – to deal with data that did not fall within the SOC and the NS-SEC classifications: retired, housewife and working in the private sector. In Greece, it is very common to report 'private sector employee' without providing further information. The lack of information beyond the job title and the ambiguity in this reporting made impossible for the researcher to code them under another category.

Grouping the 'funding' variable

The main funding sources were grouped into scholarships (1-5), employment related to research (including earnings from teaching/research, 7-9), employment not related to research (10), support from employer (6) and self-funding (11). The grouping data show that respondents of this study funded their PhD education through scholarships, self-funding, and earnings from teaching, research or employment related to research.

PhD discipline/Scientific field

The classification used is the new fields of science classification derived from the revision of Frascati Manual[225]. OECD has adopted these categories in its core module questionnaire for the careers on doctorate holders (CDH). At the same time, each field is explained in the questionnaire to the subject areas it involves e.g. see Mathematics

Natural sciences	Engineering and technology
Mathematics (*Pure mathematics, Applied mathematics; Statistics and probability*)	Civil engineering
Computer and information sciences	Electrical, electronic and information engineering
Physical sciences	Mechanical engineering
Chemical sciences	Chemical engineering
Earth and environmental sciences	Materials engineering
Biological sciences	Medical engineering
Other natural sciences	Environmental engineering
	Environmental biotechnology
	Industrial biotechnology

Due to the increasing number of interdisciplinary subjects, it was considered useful to provide the respondents with a multiple choice question where they could select more than one subjects. Thus, according to the table below (more than one disciplinary area could be selected), the PhD topic of the study participants fell more within three disciplinary areas: electrical, electronic and information engineering, biological sciences and computer science.

Living conditions

Since the age profile of the respondents concentrated around 30-40 years old, it was natural that the majority lived with their partners (34.4%) and/without children(30.3%/) . However, it should be noted that about one fourth of the total respondents lived alone.

Current employment – occupational data

The study participants were asked to fill in their job title and their main tasks. Looking at both information, the job titles were translated and coded through CASCOT using the Standard Occupation Classification DLHE (SOC - DLHE) 5 digit code. 212 job titles were coded, truncated to 4 digits and then transformed according to the National Statistics Socio-Economic Classification (NS-SEC). The data were classified accordingly to the following categories: higher and lower managerial and professional occupations, intermediate occupations and small employers and own account workers.

Size of the organization

The organizations of employment (HEI, private enterprise etc.) were classified according to the staff headcount as: small (1-49), medium (50 to 249) and large (250 or more).

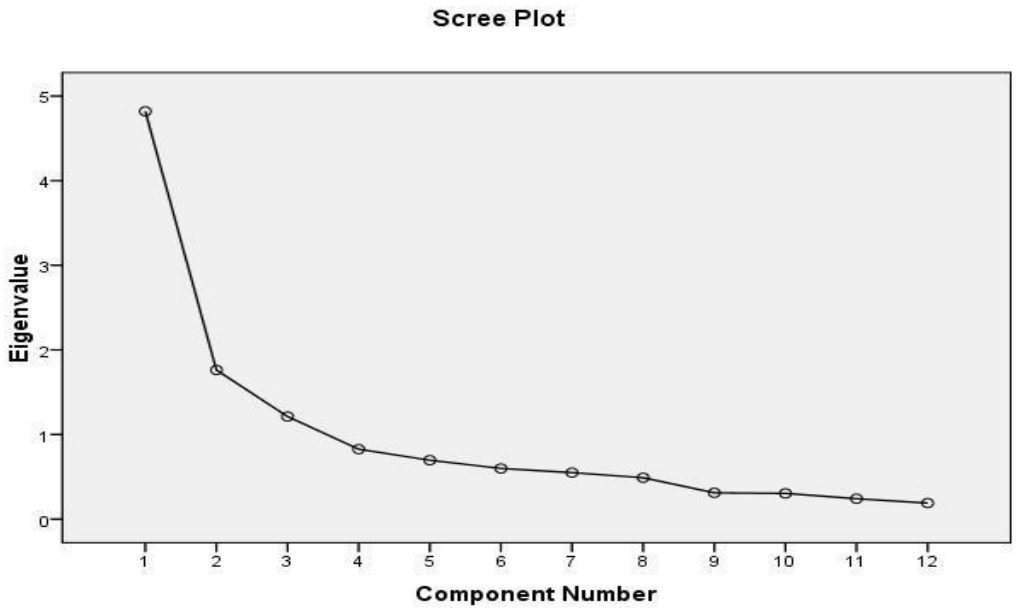
Salary- earnings

Since there is not a European system/classification of earnings, I have used LFS data to design the salary scales. Using Greek LFS data (2004 – available from a colleague at IER), tabulations for the wages of employed people who have earned a doctorate degree were exported with the use of STATA. Unfortunately it was a small percentage of the sample and they were classified according to their field of studies. While these people might have been employed in an occupation which might not be related to their field of studies, there was evidence that the average salary is quite 'homogeneous' across the disciplinary areas.The salaries range from 1084 to 1375 (mean wage). According to the Greek legal framework on academic staff salaries, early career academics such as lecturers are paid 1200-1300 Euros approximately per month. Monthly gross salary was preferred due to the Greek mentality to calculate more often the monthly rather than the annual salary (should be taken into consideration that there are 14 salaries rather than 12 due to Christmas, Easter and vacations benefits).Thus the bands were calculated through the LFS data (taking out the smallest band since we are addressing the questionnaire to doctoral graduates with the highest educational level). Although some respondents could work in other countries our main population was expected to work in the Greek labour market, and thus Euros was preferred. Research was undertaken mostly on lectureships, postdocs and research fellowships in the UK (by recruitment websites) where it was evident that the salaries were much higher than the Greek ones (even when they combined to academic jobs). It was expected that many Greek PhDs would be working in the academic sector since there are not as many high tech companies to absorb these graduates as it would be in UK. More bands were added to the Greek LFS

Principal Component Analysis

A question on job satisfaction was analysed with principal component analysis (PCA) to explore the satisfaction of respondents with aspects of current employment and compare different groups of respondents. A seven point Likert scale was used to measure the degree of satisfaction that PhD graduates with

different aspects of their current employment. According to the scale, respondents who were not at all satisfied would indicate 1 out 7 while completely satisfied respondents would indicate '7'. This question was adopted by Class of 99 (Purcell and Elias). The question included twelve items which were pertinent to aspects of current employment: salary, working, conditions, life balance, promotion prospects, job security, interesting tasks, relevance with doctoral education, meeting career goals, working hours, location, status. The addition of the item 'relevance with doctoral education 'aimed to explore to what degree the survey respondents were satisfied with that element in their current job. Before the PCA itself, data screening, assumption testing and sampling adequacy was undertaken to confirm that PCA is the appropriate tool to analyse this data. This sample has 220 cases (24 cases missing). According to Comrey and Lee's (1992) a sample with 200 cases is characterised as fair, and 300 as good. This sample has a p= 0.00<0.05 as of Bartlett's test of sphericity that defines for samples to be factored. Moreover, the value Kaiser Meter Olkin (KMO) of sampling adequacy was .841 which is . characterised as 'meritorious' by Kaiser (1974,p.35, over 0.8). Thus, it was confirmed that the sample fitted all the criteria defined for using PCA.Both rotations, varimax and oblique were used but the varimax was preferred because it was creating less noise (the promotion prospects item was loading highly on two factors in the oblique rotation). Both demonstrated three components taking into consideration the scree plot and the eigenvalues.



VARIMAX METHOD

Rotated Component Matrix[a]

	1	2	3
interesting tasks	.844		
relevance with doctoral education	.779		
meeting career goals	.773		.429
independent work	.710		
status of employment	.563		.407
working hours		.861	
life work balance		.847	
working conditions	.440	.656	
location of employment		.570	
salary			.807
promotion prospects	.622		.645
job security			.593

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

COMPARING GROUPS – INDEPENDENT T TEST

Sector of current employment: Academic versus non-academic employment

Group Statistics

	employers_binary	N	Mean	Std. Deviation	Std. Error Mean
A-R factor score 1 for analysis 1	Academic employer	139	.2259280	.89862957	.07622076
	Non-academic employer	81	-.3877036	1.05053362	.11672596
A-R factor score 2 for analysis 1	Academic employer	139	-.0114998	.91405804	.07752939
	Non-academic employer	81	.0197343	1.13825954	.12647328
A-R factor score 3 for analysis 1	Academic employer	139	-.2780949	.96092531	.08150462
	Non-academic employer	81	.4772246	.88301257	.09811251

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
A-R factor score 1 for analysis 1	Equal variances assumed	3.524	.062	4.586	218	.000	.61363167	.13379944	.34992560	.87733775
	Equal variances not assumed			4.402	147.248	.000	.61363167	.13940787	.33813305	.88913029
A-R factor score 2 for analysis 1	Equal variances assumed	4.556	.034	-.223	218	.824	-.03123414	.14008955	-.30733742	.24486913
	Equal variances not assumed			-.211	139.964	.834	-.03123414	.14834520	-.32452122	.26205293
A-R factor score 3 for analysis 1	Equal variances assumed	2.583	.109	-5.791	218	.000	-.75531945	.13043216	-1.01238894	-.49824997
	Equal variances not assumed			-5.922	179.076	.000	-.75531945	.12755025	-1.00701433	-.50362457

Country of current employment: Greece versus abroad

Group Statistics

	country_cur_empl_binary	N	Mean	Std. Deviation	Std. Error Mean
A-R factor score 1 for analysis 1	Greece	166	-.1502562	1.05296554	.08172598
	Abroad	49	.4408361	.63284383	.09040626
A-R factor score 2 for analysis 1	Greece	166	-.0125015	1.01589292	.07884858
	Abroad	49	.0338023	.90704920	.12957846
A-R factor score 3 for analysis 1	Greece	166	-.0855903	1.02953997	.07990780
	Abroad	49	.2801752	.82524133	.11789162

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
A-R factor score 1 for analysis 1	Equal variances assumed	13.222	.000	-3.732	213	.000	-.59109233	.15839097	-.90330689	-.27887776
	Equal variances not assumed			-4.850	132.721	.000	-.59109233	.12187053	-.83215217	-.35003248
A-R factor score 2 for analysis 1	Equal variances assumed	.835	.362	-.287	213	.774	-.04630380	.16134558	-.36434239	.27173478
	Equal variances not assumed			-.305	86.670	.761	-.04630380	.15168281	-.34780599	.25519838
A-R factor score 3 for analysis 1	Equal variances assumed	3.363	.068	-2.279	213	.024	-.36576551	.16049867	-.68213470	-.04939632
	Equal variances not assumed			-2.568	96.322	.012	-.36576551	.14242082	-.64845656	-.08307446

Country of doctoral education: Greece versus UK

Group Statistics

	country_acq_phd	N	Mean	Std. Deviation	Std. Error Mean
A-R factor score 1 for analysis 1	Greece	178	-.0471898	1.01749366	.07626437
	UK	42	.1999948	.90630289	.13984557
A-R factor score 2 for analysis 1	Greece	178	.0101585	.99755372	.07476981
	UK	42	-.0430529	1.02134183	.15759647
A-R factor score 3 for analysis 1	Greece	178	-.0049342	.95914564	.07189101
	UK	42	.0209116	1.17020235	.18056614

Independent Samples Test

			Levene's Test for Equality of Variances		t-test for Equality of Means						
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
										Lower	Upper
A-R factor score for analysis 1	1	Equal variances assumed	2.741	.099	-1.445	218	.150	-.24718452	.17112047	-.58444681	.09007776
		Equal variances not assumed			-1.552	67.628	.125	-.24718452	.15928917	-.56507278	.07070373
	2	Equal variances assumed	.000	.995	.310	218	.757	.05321144	.17189968	-.28558661	.39200949
		Equal variances not assumed			.305	60.821	.761	.05321144	.17443386	-.29561138	.40203425
	3	Equal variances assumed	2.464	.118	-.150	218	.881	-.02584578	.17192855	-.36470071	.31300916
		Equal variances not assumed			-.133	54.710	.895	-.02584578	.19435135	-.41538097	.36368942